TOWARD A NEW CONCEPTUALIZATION OF ENVIRONMENTAL CONCERN: PERCEPTIONS OF THREAT AND MOTIVATION FOR CHANGE AS UNDERLYING PSYCHOLOGICAL DIMENSIONS

by

Jonathan Wade Amburgey

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STATEMENT OF DISSERTATION APPROVAL

The dissertation of Jonathan Wade Amburgey

has been approved by the following supervisory committee members:

Paul H. White , Chair — 6/3/2011 (Date Approved)

Barbara Brown , Member — _____ (Date Approved)

Jonathan Butner , Member — 6/3/2011 (Date Approved)

Bert Uchino , Member — 6/3/2011 (Date Approved)

Carol Werner , Member — 6/3/2011 (Date Approved)

and by Cynthia Berg , Chair of

the Department of Psychology

and by Charles A. Wight, Dean of The Graduate School.

ABSTRACT

Theoretical and conceptual accounts of environmental concern have traditionally followed two approaches: *concern as attitudes*, or evaluations of environment-related problems and behaviors, and *concern as values* or objects of import to the individual, threatened by negative environmental conditions. Each approach has laid foundational knowledge and guidance for studying how environmental concern is implicated in proenvironmental behaviors, though an integrated framework that clearly specifies the psychological mechanisms comprising concern has been largely absent. In the current paper, a new conceptual model of environmental concern is proposed, premised on the idea that concern for environmental problems can be organized around two understudied psychological dimensions: the degree of perceived threat associated with the issue, and the degree of desired change (motivation) exhibited for effecting behavioral action. Using a survey-based methodology, cross-sectional data ($N = 455$) were collected for three environmental issues: air pollution, climate change, and loss of biodiversity. Confirmatory factor analyses and structural equation modeling procedures confirmed the validity of the proposed model, while also revealing the unique and interactive effects that perceived threat and desired change have on proenvironmental intentions, and in turn, effects on self-reported behavior. These relationships appeared to be moderated by personal relevance and self-appraised knowledge for the issues. The ability of the conceptual model to predict proenvironmental intentions was also explored in the context of integrated models incorporating Theory of Planned Behavior (TPB) constructs. The

relative impact of the conceptual model dimensions and the TPB constructs varied with the particular environmental issue studied, highlighting the diversity of multiple predictors for explaining intentions and behavior. Implications of this research, as well as future directions, are discussed.

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CHAPTER 1

INTRODUCTION

In recent years, it has become increasingly clear that human activities are detrimentally changing the natural environment on a global scale. The effects of human activities include, but are not limited to, for example, consumption of fossil fuels, which directly impact atmospheric conditions (e.g., prevalence of acid rain); deforestation, resulting in loss of flora and fauna biodiversity as well as imbalances in atmospheric CO_2 (carbon dioxide) levels; hazardous pollution levels that lead to reduced air quality (e.g., unhealthy concentrations of smog); water contamination and depletion, making fresh water reserves fewer for ever-growing populations of people; and desertification, which transforms arable lands into infertile landscapes with little to any crop yielding potential for food supplies (Gardner & Stern, 2002; Intergovernmental Panel on Climate Change [IPCC], 2007; Nickerson, 2003). In short, human activities have far-reaching effects and consequences for people and environmental conditions alike.

One approach to the study of whether people are aware of, and care about, such effects has involved research aimed at uncovering the extent to which individuals are concerned about, or exhibit worry for, the quality of the environment. Environmental problems, such as those mentioned above, are commonly reported as in the public conscious, which is to say that many people in both developing and industrial countries

report considerable concern about most environmental issues (e.g., global warming, pollution, water quality, loss of biodiversity: Bloom, 1995; Dunlap, 1985, 1991; Finger, 1994; Nisbet & Myers, 2007), yet these concerns often do not translate into direct proactive action on the part of individuals, nor do they necessarily lead to behaviors that decrease environmental degradation substantially. These two observations--that people express much concern for the environment, while simultaneously neglecting to behave in ways that curtail environmental problems--have been an important subject of interest among researchers interested in human contributions to environmental problems.

Unfortunately, theoretical progress linking environmental concern to corresponding behavior in line with those concerns has been limited in depth and guidance. Indeed, reviews of the literature on environmental concern suggest that while variables known to relate to the development of concern are well documented (e.g., socio-demographic variables such as age, education, political affiliation, socio-economic status), there has been sparse work examining the many processes or mechanisms through which environmental concern is implicated in behavior (Fransson & Gärling, 1999). Less is known theoretically about the factors that underlie concern for the environment, and the extent to which such concern (or lack thereof) guides individual decision-making and behavior. Even more problematic, however, is a general lack of a unifying frame that ties theoretical accounts of environmental concern together (Stern, Dietz, & Kalof, 1993). Often theoretical explanations neglect to specify the substantive characteristics of the construct, making it difficult to discern conceptual features and boundaries, and there exists much ambiguity in terms of what environmental concern

measures assess fundamentally (Dunlap & Jones, 2002; Stern, 1992; Van Liere & Dunlap, 1981).

In the current paper, it is proposed that much of the disparity between environmental concern and ecologically-oriented behavior may be attributable to two interrelated issues: (1) a lack of research focus on mechanisms that may directly contribute to concern--that is, dimensions of the construct that underlie its psychological significance, specifically, perceptions of threat and the motivation for desiring change; and, (2) the manner in which environmental concern has been traditionally conceptualized and measured, and therefore has been represented as a reflection of the construct. Drawing upon contemporary research and theory, a new conceptual model of environmental concern is proposed as a guiding explanatory framework for integrating and understanding *why* environmental concern may or may not be consequential for motivating behavior that affects environmental conditions. In the sections that follow, two primary approaches applied to the study of the construct of environmental concern are briefly reviewed, and then a new conceptual model is described that seeks to integrate existing ideas. This new model proposes that two important dimensions to consider when investigating concern for environmental problems are the degree to which individuals possess perceptions of threat from the issue--a personally perceived threat--and, whether there exists related motivation toward desiring change directed at affecting the environmental problem in a positive manner. The proposed conceptual model is offered as a novel theoretical framework for investigating these underlying psychological dimensions, as well as its utility for understanding environmental concern, and it is hypothesized that these two dimensions may help organize a more coherent and detailed

picture of concern-related mechanisms surrounding a variety of environmental problems. After briefly reviewing past approaches, and outlining tenets of the conceptual model, data are presented from a survey-based methodology, confirming the validity of the conceptual model, while also demonstrating its utility for further understanding and predicting proenvironmental intentions, and subsequent behavior. The conceptual model dimensions are also considered in conjunction with the effects of attitudes, social norms, and perceived control for predicting proenvironmental intentions.

CHAPTER 2

ENVIRONMENTAL CONCERN: THEORETICAL AND CONCEPTUAL PERSPECTIVES

In defining any construct, it is important to outline the basic boundary conditions and substantive ideas that give it meaning and utility. Within the environmental concern literature, this has proven to be a difficult undertaking, though two primary approaches can be identified: the *attitude* and *value perspectives*, respectively. Each of these two perspectives, though disparate in their assumptions, puts forth the basic proposition that environmental concern refers to a form of awareness and dissatisfaction with the perceived status of environmental conditions. Since research began in the 1970s on the topic of environmental concern, two assumptions have dominated most, if not all, of the social science research to date. First, environmental concern has been presumed to influence behavior, and second, environmental concern has been used as an umbrella construct intended to capture individuals' awareness and dedication to acting in proenvironmental ways. These assumptions are reflected in current definitions of the construct which suggest that environmental concern refers to "the degree to which people are aware of environmental problems and support efforts to solve them and/or indicate a willingness to contribute personally to their solution" (Dunlap & Jones, 2002; 2003). This conception of the construct places emphasis on individuals' awareness and unease with

the state or quality of the environment, and the accompanying beliefs germane to concern, though the actual source of an individual's concern, and how it is conceptualized and measured, is based on whether the researcher adopts the attitude or value approach as a theoretical or conceptual guide. As described below, the environmental concern construct has most often been defined as an attitude or value, or both, either explicitly or implicitly throughout its history. This in turn has had implications for how investigators conceptualize and investigate concern-behavior relations.

Overview of Approaches

For purposes of breadth, the two approaches described are discussed broadly in a way that highlights the ideas that have received considerable interest, while also spurring continued empirical research. This is by far not an exhaustive or fully comprehensive review of all the available research, and the focus of the review is on describing the variables, constructs, and conceptualizations that have been of most theoretical interest to researchers in this area. Particular attention is devoted to the areas of research that have led to theoretical progress in the literature. In the now 40 years of research on the topic of environmental concern, many conceptualizations have been proposed, though it is not always clear what defining conceptual features make up the construct, and few attempts have been made to integrate and organize themes in the literature. This undertaking is complicated by the fact that the construct of environmental concern has been investigated from the perspective of researchers from multiple disciplines (e.g., environmental psychology, sociology, political science), each with diverse theoretical orientations and

assumptions, with estimates of the number of published studies around 1000 or more (Dunlap & Jones, 2002). Thus, while complete coverage is not one of the intended goals of the present paper, detailed and comprehensive discussions can be found in reviews offered by Fransson and Gärling (1999) and Dunlap and Jones (2002).

The Attitude Approach

Within the attitude approach, the construct of environmental concern is generally equated with the concept of environmental attitudes (Dunlap & Jones, 2003; Stern, 1992; Thompson & Barton, 1994; Van Liere & Dunlap, 1981; Weigel & Weigel, 1978), or a general attitude (Bamberg, 2003; Vining & Ebreo, 1992). Researchers who adopt this approach discuss concern as consisting of attitudes and beliefs about environmental problems, human-environment interactions, as well as perceptions and worldviews of nature more broadly (Dunlap, 2008; Dunlap & Van Liere, 1978; Dunlap, Van Liere, Mertig, & Jones, 2000). Schultz, Shriver, Tabanico, and Khazian (2004) suggest that environmental attitudes represent "the collection of beliefs, affect, and behavioral intentions a person holds regarding environmentally related activities or issues" (p. 31; see also Milfont & Duckitt, 2004), which is consistent with contemporary attitude theory perspectives that emphasize the cognitive, affective, and behavioral components of attitudes (e.g., Eagly & Chaiken, 1998).

It is important to note, however, that researchers who adopt the attitude approach seldom separate the conceptualization of attitudes as a form of evaluative judgment from other distinct, though related attitude attributes, such as beliefs. Instead, the construct of environmental concern is conceptualized within the attitude approach as consisting of

both evaluations of objects related to an environmental problem, such as how favorable-unfavorable one thinks or feels toward an issue, and second, whether the person possesses any associated beliefs or behaviors relevant to the environmental problem of interest (e.g., whether the individual believes the issue is a problem and/or engages in any subsequent behaviors). As is not always apparent in the attitude approach, the use of the terms attitude and belief are most often intended to convey the view that concern over environmental problems reflects a level of disfavor with the issue, with such negatively valenced judgments influenced by the particular knowledge, whether factual or perceived, that the individual holds (see Fishbein & Ajzen, 1975). This conceptualization of *concern as attitudes* is represented in Figure 1.

From the *concern as attitudes* conceptualization, the attitude approach has informed two directions that investigators typically pursue in environmental concern research. First, concern is measured as an attitude either globally in conjunction with a broad range of behaviors, or, second, concern is measured as an attitude in accord with specific beliefs and specific behaviors of environmental consequence. Thus, the distinction within this approach is the degree of specificity between the attitude and the behavior measured. The practice of matching the same level of specificity between a global attitude and global behavior, and a specific attitude with a specific behavior has been shown to be an important moderator of attitude-behavior relations (Ajzen & Fishbein, 1977; Weigel, 1983). As this relates to understanding environmental concern, researchers have frequently considered the congruency of attitude-behavior measures for predicting environmental behaviors (Bamberg, 2003; Kaiser, Wölfing, & Furher, 1999;

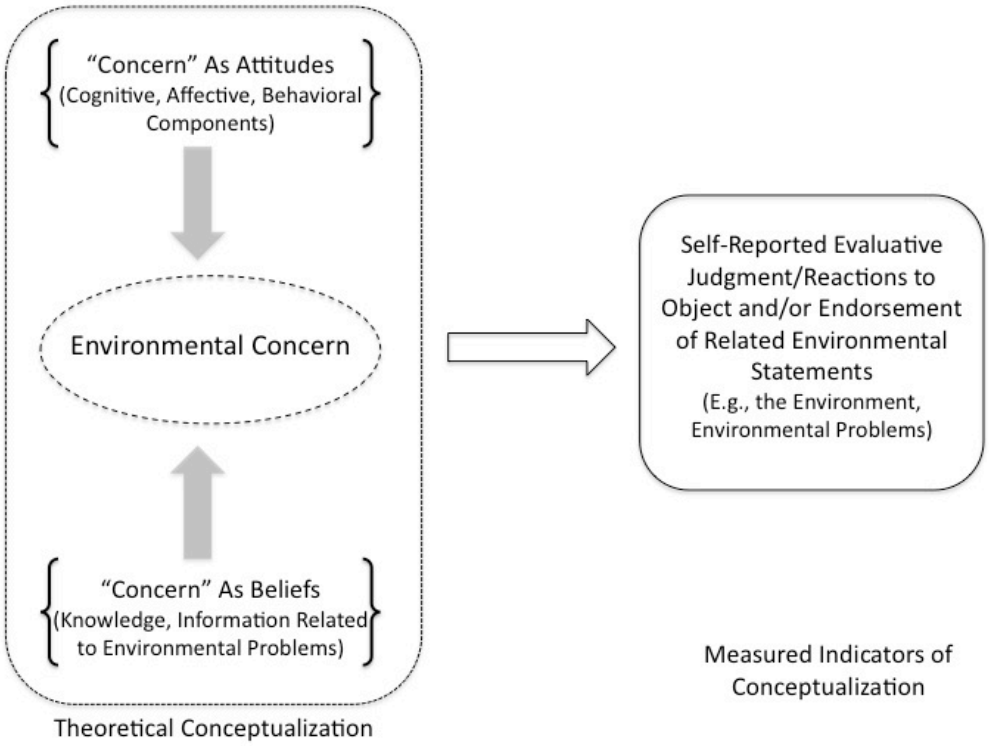

Figure 1: Attitude approach conceptualization.

Stern & Oskamp, 1987; Weigel, Vernon, & Tognacci, 1974), especially since this subtle methodological issue of measurement has been useful for improving observed relations among attitudes and proenvironmental behavior.

These two directions can be further differentiated by whether investigators purposely select to measure attitudes toward the environment itself (however idiosyncratically defined), and/or attitudes toward an ecological behavior or series of behaviors of interest. Kaiser et al. (1999) have noted that often either the object of one's attitude is the natural environment or some aspect of it (e.g., air quality) or the attitude object is an ecological behavior (e.g., recycling or political activism); the former is more in line with current conceptualizations of environmental concern, placing emphasis on

attitudes and beliefs about the environment, rather than one's behavior, though it is also the case that neither object is explicitly discussed, nor separated empirically. Distinguishing between the environment as an attitude object and a particular behavior or class of behaviors as the object is preferable since attitudes toward the general environment may be discrepant from specific attitudes toward an associated behavior (*cf.,* Fishbein & Ajzen, 1975).

A growing line of work has approached environmental concern from a different angle. For example, Schultz et al. (2004) have produced evidence that environmental concern, which they conceptualize as environmental attitudes, is associated with the degree to which an individual connects or identifies with aspects of the natural environment. These researchers suggest that environmental concern results from the implicit or unconscious connectedness that an individual feels toward nature. Using a modified version of the Implicit Association Test--an automatic, reaction time-based measure of self-nature associations (see Greenwald, McGhee, & Schwartz, 1998) --Schultz et al. (2004) have demonstrated that individuals associate their implicit attitudes toward nature with other environmental attitudes, such as how worried they are that human behavior harms nonhuman species (e.g., plants, animals), as well as the self and others (see also Bruni & Schultz, *in press*; Schultz & Tabanico, 2007).

Similarly, other research has focused on the explicit or overt ways in which individuals represent facets of their self-identity as being included within their conception of nature (Clayton & Opotow, 2003; Schultz, 2002a), and currently there has been an emergence of several measurement instruments designed to capture individual differences in aspects of self-nature connections. For example, constructs such as

commitment to the environment (Davis, Green, & Reed, 2009), nature relatedness (Nisbet, Zelenski, & Murphy, 2009), and love and care for nature (Perkins, *in press*) have been shown to contribute to the prediction of proenvironmental intentions and behaviors. This research, in conjunction with the implicit attitude research of Schultz et al. (2004), Schultz and Tabanico (2007) and Bruni and Schultz (*in press*), emphasizes self-nature connectedness as the basis of environmental concern, and like others who adopt the attitude approach, conceptualize concern as an attitudinally-based construct.

The Value Approach

Other researchers have conceptualized environmental concern as consisting of specific value types or particular value-orientations of concern, with values often viewed as determining or filtering attitudes toward various environmental problems (Schultz & Zelezny, 1999; Schultz et al., 2005; Stern, 2000; Stern & Dietz, 1994; Stern et al., 1993; Stern, Dietz, Abel, Guagnano, & Kalof, 1999). Within this approach, the value concept is derived largely from the work of Rokeach (1973) and Schwartz (1992, 1994), with values representing morally-laden standards, principles, and beliefs that are thought to organize and influence attitudes and behavior.

For example, Stern and Dietz (1994), in their value-basis theory, propose that concern for environmental problems are the result of an awareness of the harmful consequences to valued objects (see also Schwartz, 1977; Stern et al., 1993; 1999). Within this framework, concern is conceptualized as beliefs that valued objects will be harmed as the result of environmental problems, and individuals orient their concern around three valued sources: the self, other people, or all living things. Each of these

sources is referred to as egoistic, social-altruistic, and biospheric value- orientations, respectively. To the extent that these valued objects are threatened, individuals will, according to the theory, exhibit varying levels of concern. Thus, dangers from environmental problems are concerning when their harmful consequences are realized and viewed as threatening to the valued object.

Similarly, and building on the work of Stern and Dietz (1994), Schultz (2000, 2001) has identified three interrelated factors that he and his colleagues argue comprise a tripartite structure of environmental concern. These three factors include egoistic concerns (concern for oneself, one's health, one's lifestyle, and future), altruistic concerns (concern for people in one's country/community, all people, children, and one's own children), and biospheric concerns (concern for plants, marine life, animals, and birds). These concerns, which are presumed to be the direct result of underlying values (Schultz, 2001), are thought to reflect attitudes about the consequences of harming nature for the three valued objects (Schultz, 2001, 2002b). That is, each of these types of concern represent beliefs that environmental problems have harmful consequences for the object that is valued. Interestingly, individuals can vary on which object or combination of objects they believe will be affected by the harmful consequences of environmental problems, and Schultz (2001, 2002b) suggests that different individuals can be concerned about environmental problems for different reasons using these classifications (see also Snelgar, 2006). Figure 2 presents a diagram summarizing this *concern as values* approach conceptualization.

Stern (2000), Stern et al. (1993), and Stern, Dietz, Kalof, and Guagnano (1995) have pursued a similar line of work based this these ideas (see also Hansla, Gamble,

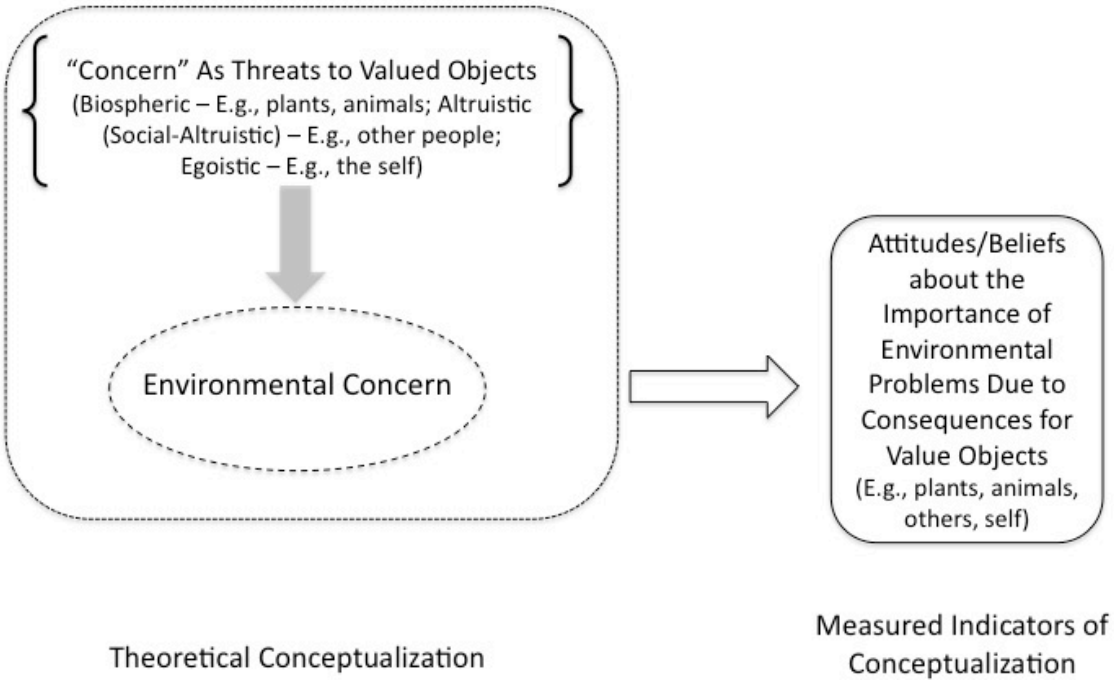

Figure 2: Value approach conceptualization.

Juliusson, & Gärling, 2008), and have developed a theoretical model that incorporates elements of this value theory as well as norm-activation theory (Schwartz, 1973, 1977). This model presumes that values and personal moral norms of obligation influence behavior through their association with three belief-related constructs: ecological worldview, awareness of consequences for valued objects, and the perceived ability to take responsibility for reducing threats.

According to this value-belief-norm (VBN) theory of environmentalism, biospheric, altruistic, and egoistic values affect beliefs about human-nature interactions and inform an ecological worldview (measured by the New Environmental/Ecological Paradigm: Dunlap & Van Liere, 1978; Dunlap et al., 2000), which in turn influences

beliefs about threats to valued objects (e.g., other people). These beliefs, which are presumed to reflect concern for environmental problems, in turn, initiate an ascription of responsibility whereby an individual feels compelled to reduce the threat, only then activating a sense of moral obligation that leads to proenvironmental behavior. Causally, the VBN theory postulates that these five constructs (values, ecological worldview, the belief in adverse consequences, perceived ability to reduce threats, and personal moral norms) exert direct and additive effects on the likelihood of an individual engaging in proenvironmental behavior, and specifically, environmental activism. Further, the VBN theory integrates, though broadly, both elements of the attitude and value approaches, with values centered as the causal underpinning of behavior, and ultimately the conceptualization of concern, though unlike the attitude and value approaches, norms are argued to be the most proximate and direct antecedent of behavior.[1]

Links Between Perspectives

As suggested in the review above, and noted by Fransson and Gärling (1999), environmental concern has been used in the literature to refer to both attitudes and values.

[1] It is interesting to note that while VBN theory incorporates the influence of normative behavior, and specifically individual beliefs about a felt moral responsibility to act proenvironmentally, this is arguably not necessarily a separate approach since values are presumed to be the primary casual agent underlying behavior in the theory. Similarly, other process-oriented models of behavior include the role of norms, such as the Theory of Planned Behavior (Ajzen, 1985, 1991), and its precursor, the Theory of Reasoned Action (Ajzen & Fishbein, 1977), but these too can be viewed as fitting within the attitude approach given that both theories originated from social psychological work on attitude-behavior relations.

Both approaches have laid foundational knowledge and groundwork for directing research, as well as more or less specificity in terms of identifying relevant variables implicated in environmental behaviors. However, neither alone appears to capture what is implicitly or explicitly assumed to underlie the construct, and rather than approach the study of environmental concern in a either/or fashion, and debate the theoretical merit of one conceptualization over another, perhaps more may be gained by considering the similarities they share. That is, perhaps the distinctions between the two approaches are less important than the fundamental ideas they imply in terms of accounting for why such concern should be meaningful for an understanding of environment-related behavior. I propose that rather than examine environmental concern according to one perspective or another, let theoretical ideas from both guide an integrative conceptualization that recognizes fundamental variables contained within each approach.

Why might this be important? My reasoning is that first, regardless of whether one adopts the attitude or value approach as an expression of concern, there still remains only modest correlations between environmental concern and behavior. For example, in their seminal meta-analysis of proenvironmental behavior, Hines, Hungerford, and Tomera (1986) found only a mean correlation of $r = .37$ ($N = 9$ studies) between environmental attitudes and behavior. More recently, in an extension of the work of Hines et al. (1986), Bamberg and Möser (2007) reported a mean correlation of a similar magnitude, with the association between attitudes and behavior equal to .42 ($N = 17$ studies). Taken together, environmental attitude (and the values presumed to underlie them) seems to only account for a relatively small amount of the variance in proenvironmental behavior ($r^2 = 13.6$ - 17.6% variance explained). Attempts to discover

why these modest relations exist are theoretically and practically important since environmental concern holds a prominent place in many theories of environmental behavior. Perhaps by focusing on the variables that are more closely tied to ideas common to the attitude and value approaches more insight can be obtained that speaks to the psychological underpinnings of concern, and why such concern, however expressed, takes on relevance for directing individual action.

Second, and related to the issue of modest relations between concern and behavior, is the problem of measurement. To the extent that environmental concern and behavior are causally linked, this can only be accurately examined when proper measurement strategies are employed. Measurement strategies that insufficiently capture the psychological processes underlying concern may only cloud and underestimate true relations. For example, no standard measurement instrument of environmental concern has presently been established (Stern, 1992), leading researchers to develop their own measures, and/or use other theoretically-related measures believed to be conceptually similar to environmental concern. In some instances, researchers have relied on single-item measures to infer environmental concern (e.g., "*How concerned are you about environmental issues?*"), a popular method used in national polling surveys. This method, while informative for gaining a snapshot of public opinion on the environment, and tracking attitudes/beliefs over time, is limited to description and neglects to account for an explanation of why individuals are concerned.

In other instances investigators have used theoretically-related constructs to infer environmental concern, or equated environmental concern with other, though arguably distinct, constructs such as whether individuals are aware of the adverse consequences of

environmental problems (e.g., Fujii, 2006). This is, however, potentially problematic because being aware of the consequences of environmental problems may or may not be related to actual concern about environmental problems. Knowledge of the effects of environmental problems does not necessarily lead to concern about those problems (Arcury, 1990; Kollmuss & Agyeman, 2002; Nickerson, 2003), and such equating of constructs and measures may only further the theoretical ambiguity of an understanding of environmental concern. A review of all the available measures of environmental concern is beyond the scope of the present paper, though Van Liere and Dunlap (1981) have demonstrated that not all measures are equivalent, nor do they assess the same sort of substantive issues used to infer concern (see also Dunlap & Jones, 2002, 2003) for a discussion of measurement issues).

A Novel Integration and Reconceptualization of Perspectives

A commonality between the two approaches is that the construct of environmental concern simultaneously represents both an attitude toward, or evaluations of, threatening environmental conditions (i.e., attitude approach), as well as perceptions of threat to valued objects (i.e., value approach). Conceptually, these themes can be understood in terms of the degree of threat to a valued object (e.g., self, others, plants, animals, or some combination), and the degree of desired change or motivation sought for existing environmental conditions. That is, environmental concern reflects expression of attitudes, beliefs, and values that embody a perception of personal threat toward a valued object or objects *and* the belief that a level of action should be undertaken in order to alleviate or altogether remove the source of the threatening condition.

Regarding the latter, intuitively concern over a particular environmental problem implies a more or less desired state: the current state or condition--the problem itself--is perceived as needing to be changed, altered, or corrected in some way. This can be considered a psychological state of dissatisfaction that goes beyond mere awareness or knowledge of the consequences of environmental problems in that an individual feels, to a varying degree, that action is needed, relative to the threat that is perceived as harmful.

For example, concern about the effects of climate change may stem from a perceived threat to one's well being, the feared well being of significant others, the biosphere, or some combination. Simultaneously, there may also exist a motivation or desire to take tangible action, in a variety of forms, as a way to confront the perceived threat. While constructs such as the awareness of consequences emphasize a recognition of the negative effects of environmental problems, this conceptualization of concern neglects an important psychological attribute: that individuals may be aware of an environmental problem, even believe it to be harmful, yet still lack any motivation to take behavioral action. Moreover, the tendency to focus on the assumption that consequences alone directly lead to behavior in the absence of motivation is a limiting feature that has yet to be systematically explored and integrated. Unlike the two approaches previously discussed, which have been largely considered in isolation, this new interpretation of environmental concern as consisting of threat-based and motivation-instigated dimensions offers a novel reconceptualization that integrates current theoretical ideas and research findings. Moreover, this integration reveals a theoretical possibility that may help explain the substantive content and basis of environmental concern, clarifying its

construct validity, which in turn may help shed light on the construct's role in affecting environmentally significant behavior.

Expanding the Definition of Environmental Concern

One important implication of the themes drawn from the two approaches is that environmental concern, as it is currently defined, may be restricted in several respects. As mentioned earlier, the contemporary definition of environmental concern places emphasis on the awareness of environmental problems, as well as a willingness to support and/or contribute personally to problem solutions (Dunlap & Jones, 2002, 2003). This definition, while informative at a general, descriptive level, excludes an important conceptual theme drawn from the attitude and value approaches. This theme is the idea that environmental concern represents a perception of threat toward valued objects, and incorporation of this theme into the existing definition of environmental concern may have several advantages.

First, inclusion of the idea that concern represents a perception of threat, and not just mere awareness helps more clearly explain the phenomenon in addition to describing it. By incorporating perceptions of threat as a defining feature of the construct, there would likely be less ambiguity about what concern represents in the mind of the individual, as well as what is indirectly referred to or implicitly assumed in many existing conceptual and theoretical accounts. Thus, incorporating the idea of concern as representing a perceived threat brings to the forefront a clarified meaning for what is meant by 'concern'. Second, including the idea of a perception of threat would provide a common base from which to examine how individuals think about and react to environmental problems. In so far as the adoption of threat as a meaningful construct is

productive for advancing theory, a revision of the current definition of environmental concern seems reasonably warranted. I propose, therefore, that environmental concern be expanded to include the following features: Environmental concern represents an individual's expressed evaluation and appraisal of the perceived threat of an environmental problem as well as the motivation to take behavioral action intended to affect the issue. This definition, I believe, more fully encompasses the phenomena that past theorizing and research have attempted to conceptually understand.

Toward a New Theoretical Framework: A New Conceptual Model of Environmental Concern

As a way to bring about a clarified theoretical understanding of environmental concern, and the construct's relationship to environmental behavior, a new conceptual model is proposed based on themes of the attitude and value approaches, and the suggested expanded definition of environmental concern (Figure 3). Paramount to this model is the proposition that the construct of environmental concern can be organized around two psychological dimensions that function as a barometer, or gauge, of concern: degree of perceived threat and degree of desired change. Within this conception of the construct, the degree of perceived threat represents an individual's personally perceived assessment of harm from a particular environmental condition or issue. Thus, the extent to which a person perceives an environmental problem as threatening will vary along a continuum of low to high threat. In the model, this dimension is conceived of as an evaluative component that is sensitive to indicators of harm based on one's knowledge and experiences--influenced by the social and physical context in which one is

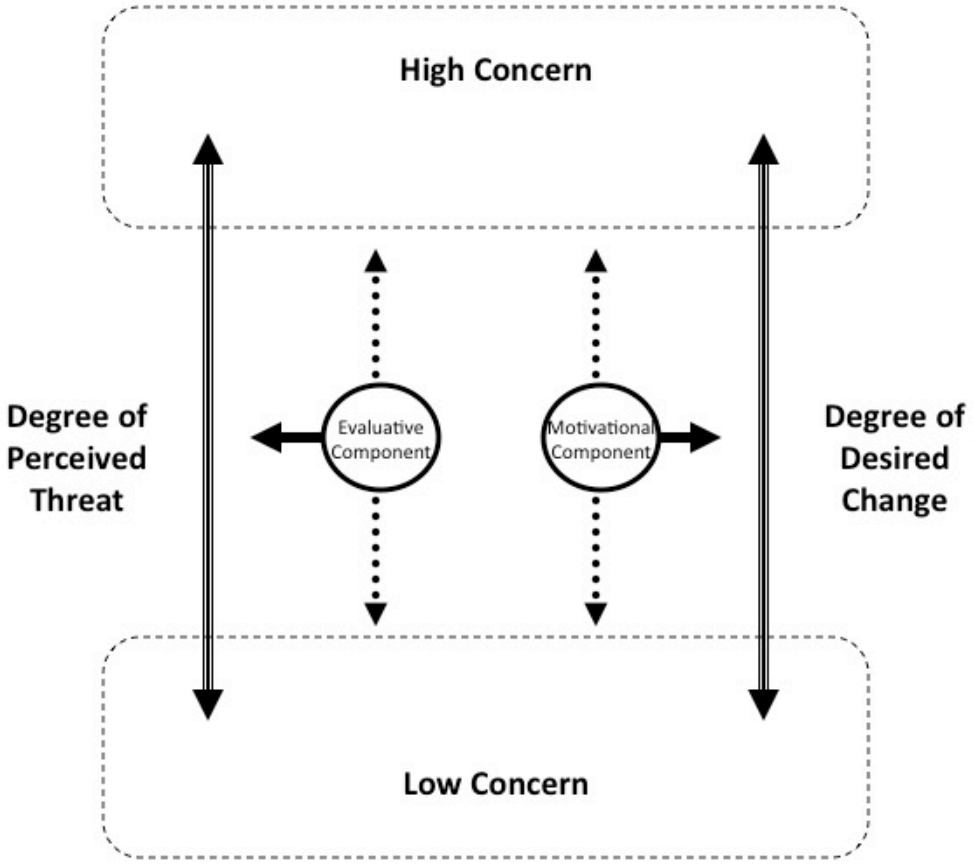

Figure 3: Proposed conceptual model of environmental concern. *Note*: Within the conceptual model, the two dimensions of perceived threat and desired change (motivation) are each hypothesized to operate as barometers of environmental concern that can fluctuate in matching and/or divergent directions (e.g., side-by-side or diagonal and opposing tracks).

embedded. This component is evaluative in the sense that a perceived threat from an environmental condition is deemed negative in nature, and is perceived as potentially harmful to a valued object of importance to the individual. The valued object associated with the threat may pertain to the self, others, plants, animals, the biosphere, or some combination, and need not be objectively threatening, merely perceived. While the target

of the perceived threat may vary from person to person, and with any given environmental issue (e.g., climate change vs. pollution), the primary feature of the model is that a personal threat is perceived, regardless of which valued object(s) the threat pertains to.

This assumption does not neglect the possibility of several valued objects being threatened simultaneously; for example, a threat to self could coexist with perceived threats to valued others, nor is the possibility of several threatened objects contributing to perceptions in unique ways discounted. It is merely the perceived presence of the threat and whether the threat is considered harmful for the valued object that is ultimately important for this dimension. One can view the perception of multiple threats as a likely magnifier of perceptions, with multiple threatened objects elevating one's global perceived threat along the dimension. It could be expected, for example, that as the number of threatened objects increases, so too should the accompanying severity of the problem, and therefore the potential for harm. In addition, if a threat is perceived as affecting an object other than the self (e.g., significant others), and the threatened object is important enough to one's identity and interests, then this self-object identification could potentially moderate one's level of perceived threat. In so far as the threatened object is valued, so too should the object be identified with in a psychologically meaningful way, lending itself to being vulnerable to harm. That is, threats to objects other than the self, if sufficiently valued and important to the individual, are assumed to still represent a personal threat because they hold significance for the individual. This tenet is based on the finding that individuals tend to include within their sense of self not only self-specific attributes (e.g., unique traits, personal skills and abilities), but also

cognitive representations of significant others (Aron, Aron, & Smollan, 1992; Aron, Aron, Tudor, & Nelson, 1991) as well as characteristics of the natural environment (Schultz, 2002a; see also Leary, Tipsord, & Tate, 2008). These cognitive representations of objects included within one's self-identity are assumed within the conceptual model to influence perceived threat to the extent that they are valued and identified with in relation to an environmental problem.

It is important to recognize that the perceived threat stemming from environmental problems is not a new idea in terms of conceptualizing environmental concern. For example, Baldassare and Katz (1992) demonstrated that a perceived personal threat to one's well-being and health is a significant predictor of environmental practices (e.g., limiting driving to reduce air pollution, purchasing environmentally safe products, recycling), even above and beyond demographic variables such as education-level and political affiliation and degree of liberal-conservativeness. Similarly, others have investigated appraisals of threat to the self and the environment in relation to environmental hazards (Schmidt & Gifford, 1989), as well as the role of fear appeals (e.g., Hass, Bagley, & Rogers, 1975; Hine & Gifford, 1991; Rogers, 1975) and risk perceptions (Slovic, 1987), further lending support for the inclusion of threat-based dimensions in environmental concern theorizing.

The second psychological dimension of environmental concern can be understood as reflecting a motivational component in which an individual possesses varying sentiments for change directed at alleviating or removing the perceived threat. This dimension is also hypothesized to vary along a continuum, though one of desired change (or lack thereof), and reflects an individual's motivation toward wanting an

environmental problem to be addressed. Within the conceptual model, this motivation represents an individual's felt need and conviction to address the issue: a state of being upset about the issue, and believing that the issue is important, requiring action. An individual may possess a variety of beliefs (and subsequently enact behaviors) that are suggestive of the desired change. For example, an individual alarmed by the negative effects of climate change may think that driving their automobile less mitigates their carbon footprint, thereby reducing greenhouse gases. The same individual may also choose to drive their automobile less in the service of bringing about the desired change. However, it is not assumed in the conceptual model that desiring change (or lacking change) will directly lead to corresponding behavior in all circumstances, nor is it assumed that individuals possess a single means or strategy of enacting change toward environmental problems. There may be a variety of actions that an individual believes will affect a particular environmental problem, and the extent to which a given behavior is pursued in the service of affecting change will depend upon several considerations.

For the dimension of desired change, an individual's level of motivation toward enacting action is hypothesized to exert a directive influence first on the person's behavioral intentions to engage in behavior. Desired change, therefore, is motivation focused in the direction of proactive action. If the perceived threat and the desire for change are sufficiently high, that is, the individual feels a substantial level of threat from an environmental problem and the threat in turn corresponds to the individual's motivation to take action, then it could be expected that the person's behavioral intention would also correspondingly be high. If an individual's behavioral intention is low, which

would be expected in situations where the individual's perceived threat and motivation are low, then behavior is unlikely to occur.

This emphasis on behavioral intention rather than actual behavior is an important distinction within the conceptual model because much social-psychological research has shown that intentions are an important proximate predictor of behavior (e.g., Ajzen, 1991; Fishbein & Ajzen, 1975). In the context of the conceptual model, the interaction between an individual's level of perceived threat and their desire for change is proposed to jointly produce a behavioral intention to act. However, even if an individual's perceived threat and their subsequent desire to act are sufficiently high, producing a behavioral intention, this still may not guarantee behavior. It is not assumed within the conceptual model that behavioral intentions will directly lead to behavior occurring. Individuals who desire that action for an environmental problem be taken may never engage in any problem-relevant behaviors for a variety of reasons: psychological elements as well as physical barriers may serve to encourage or hinder action. For example, an individual who feels threatened by climate change may be motivated to take action by reducing their home electricity consumption, but may not have the financial resources to purchase more energy efficient appliances.

Of importance to this dimension of environmental concern is the notion that an individual's degree of preference toward change will largely, though not solely, be influenced by one's degree of perceived threat, but these dimensions need not have fixed relations. The extent to which an individual perceives harm from an environmental condition is hypothesized to exert a motivational desire to contribute to and effect change, though it is not assumed that motivation is solely dependent upon perceptions of

threat. That is, perceptions of threat due to an environmental problem may serve to increase motivation, if sufficiently threatening, but motivation for engaging in behavioral responses directed at affecting the problem may also result from other sources (e.g., individual and situational factors). Thus, within the conceptual model, perceived threat is sufficient to instigate motivation, but it is not required. Both dimensions are hypothesized to operate as unique and interacting agents. These two dimensions, it is proposed, jointly form the substantive content of the construct environmental concern, and are hypothesized to help improve an understanding of how environmental concern, conceptualized in this manner, is implicated in proenvironmental behavior.

Research Questions

Four research questions of interest were each investigated in the current study:

Research Question 1: To what extent do the two dimensions of the conceptual model of environmental concern, perceived threat and desired change (motivation) reflect an individual's beliefs and generalize across several environmental problems?

Research Question 2: Do the two dimensions of the conceptual model of environmental concern interact, and, if so, how do they influence intentions and behavior? What unique effects do these dimensions have on intentions and behavior?

Research Question 3: Does perceived threat predict individual's desired change, that is, can perceived threat explain variance in individual's motivation, and what effects do these relationships then have on intentions and behavior?

Research Question 4: Do the two dimensions of the conceptual model account for variance in the prediction of intentions and behavior when including the effects of other constructs such as attitudes, social norms, and perceived behavioral control?

CHAPTER 3

METHOD

Participants

Participants consisted of undergraduate students enrolled in psychology courses at the University of Utah, and received partial course credit or extra credit toward course work for their participation. The sample consisted of 455 students (261 female, 184 male; 10 did not report gender) ranging from 17 to 51 years in age ($M = 22.52$, $SD = 4.96$; *Median age* = 21).

Procedure and Materials

Participants completed questionnaire booklets containing survey items designed to measure the conceptual model dimensions as well as other constructs as part of a cross-sectional survey-based methodology. Participants completed survey items in groups ranging from 1 to 6 in a designated laboratory space within the Department of Psychology. Each participant was seated in a cubicle space separated by dividers, and responded to survey items independently. Survey items took approximately 30 minutes to complete. Following completion of the study, participants were debriefed and thanked for their participation.

Questionnaire Booklets

The order in which participants completed survey items pertaining to three environmental topics (air pollution, climate change, and loss of biodiversity, respectively) was randomly determined; questionnaire booklets were counterbalanced by order of the three topics to reduce potential bias from carryover effects.

Environmental Topics

Three environmental topics, air pollution, climate change, and loss of biodiversity, were selected as issues of interest. These three issues were selected because they reflect diverse, though related, environmental problems that pose direct implications for human welfare. For each of the three topics, participants provided self-reports of how personally threatened they felt by each of the issues, as well as how motivated or compelled they were to do something about the negative effects these environmental problems present. Specifically, for each of the three environmental topics, participants responded to three questions pertaining to perceived threat (likelihood of harmful effects, whether danger exists (severity), and worry about negative effects) and desired change (importance of addressing the issue, degree of being upset, and motivation for taking action due to negative effects). Tables 1, 2, and 3 list these items as well as descriptive statistics based on participant's responses. Participants responded to each item using a 7-point scale ranging from 1 = *Strongly Disagree* to 7 = *Strongly Agree*, and items measuring the same facets (e.g., harm, danger, motivation) of the two dimensions (perceived threat and desired change) were similarly worded so that comparisons across environmental topics could be made. That is, items intended to measure the two

Table 1

Descriptive Statistics of Air Pollution Survey Items

Survey Items and Corresponding Conceptual Model Dimensions - Air Pollution	*M*	*SD*	*N*
Perceived Threat Items	Cronbach's α = .73		
(1) I think that it's unlikely that air pollution levels are having harmful effects on my well-being. (*R*)	5.96[a]	1.48	455
SEM Model Label: "Harm"			
(2) Air pollution is approaching a dangerous level in my opinion.	5.54[a]	1.45	455
SEM Model Label: "Danger"			
(3) I am worried about the negative effects air pollution might be having on me.	5.22[a]	1.56	455
SEM Model Label: "Worry"			
Desired Change Items	Cronbach's α = .85		
(4) I believe it is important that air pollution issues be addressed.	6.07[a]	1.11	455
SEM Model Label: "Importance"			
(5) It upsets me that more isn't done to address air pollution problems.	5.14[a]	1.59	455
SEM Model Label: "Upset"			
(6) The potential negative effects of air pollution motivate me to want to do something about it.	4.74[a]	1.57	455
SEM Model Label: "Motivation"			

Note: (*R*) indicates reverse-scored item; [a] $p \leq .00$ for midpoint of scale.

Table 2

Descriptive Statistics of Climate Change Survey Items

Survey Items and Corresponding Conceptual Model Dimensions - Climate Change	*M*	*SD*	*N*
Perceived Threat Items	Cronbach's α = .82		
(1) I think that it's unlikely that climate change is having harmful effects on my well-being. (*R*)	4.66[a]	1.88	455
SEM Model Label: "Harm"			
(2) Climate change is approaching a dangerous level in my opinion.	4.42[a]	1.84	455
SEM Model Label: "Danger"			
(3) I am worried about the negative effects climate change might be having on me.	3.98[a]	1.85	455
SEM Model Label: "Worry"			
Desired Change Items	Cronbach's α = .92		
(4) I believe it is important that climate change issues be addressed.	5.26[a]	1.69	455
SEM Model Label: "Importance"			
(5) It upsets me that more isn't done to address climate change problems.	4.37[a]	1.96	455
SEM Model Label: "Upset"			
(6) The potential negative effects of climate change motivate me to want to do something about it.	4.24[a]	1.8	455
SEM Model Label: "Motivation"			

Note: (*R*) indicates reverse-scored item; [a] $p \leq .00$ for midpoint of scale.

Table 3

Descriptive Statistics of Loss of Biodiversity Survey Items

Survey Items and Corresponding Conceptual Model Dimensions - Loss of Biodiversity	*M*	*SD*	*N*
Perceived Threat Items	Cronbach's α = .73		
(1) I think that it's unlikely that loss of biodiversity is having harmful effects on my well-being. (*R*)	5.16[a]	1.59	454
SEM Model Label: "Harm"			
(2) Loss of biodiversity is approaching a dangerous level in my opinion.	4.78[a]	1.59	455
SEM Model Label: "Danger"			
(3) I am worried about the negative effects biodiversity loss might be having on me.	4.04[a]	1.61	455
SEM Model Label: "Worry"			
Desired Change Items	Cronbach's α = .88		
(4) I believe it is important that biodiversity issues be addressed.	5.60[a]	1.37	454
SEM Model Label: "Importance"			
(5) It upsets me that more isn't done to address biodiversity problems.	4.67[a]	1.74	455
SEM Model Label: "Upset"			
(6) The potential negative effects of losing biodiversity motivate me to want to do something about it.	4.53[a]	1.58	455
SEM Model Label: "Motivation"			

Note: (*R*) indicates reverse-scored item; [a] $p \leq .00$ for midpoint of scale.

dimensions of the conceptual model were similarly worded for each environmental topic so that measurement of the dimensions did not differ across the three issues.

In order to determine which of the three environmental issues participants rated as the most personally threatening, and how motivated to act they felt by the issue, summed composite scores were created for each of the two dimensions. Participants' responses to the three items indicating their level of perceived threat, as well as the three items indicating desired change were summed, yielding two overall composite scores of perceived threat and desired change. Scores could range between a low value of three and a high value of 21 along a continuum of perceived threat and desired change, respectively. Mean composite scores revealed that air pollution was rated as the most threatening environmental problem (M = 16.73, SD = 3.63), followed by loss of biodiversity (M = 14.00, SD = 3.87), and lastly, climate change (M = 13.07, SD = 4.79). These mean differences (i.e., comparisons between each of the three sample means) were each statistically significant ($ps < .01$). The same ordered differences were also obtained for desired change: Participants rated air pollution (M = 15.97, SD = 3.81) as the most motivating issue, followed by loss of biodiversity (M = 14.82, SD = 4.24), and lastly climate change (M = 13.88, SD = 5.07). Each mean comparison was statistically significant ($ps < .01$).

Because participants might not be as familiar with the topic of loss of biodiversity, relative to air pollution and climate change, which tend to receive more educational and media attention, participants were provided with a brief description of what is commonly meant by the environmental problem of loss of biodiversity. In each questionnaire booklet, participants were provided the following information pertaining to

loss of biodiversity before responding to survey items: "*Loss of biodiversity refers to the decreasing number and variety of biological organisms currently living on the earth (e.g., plants, animals, insects). This environmental issue involves plants, animals, and other life forms decreasing in their population numbers or becoming extinct due to natural or human-caused events (e.g., catastrophic weather such as prolonged drought, destruction of habitat from pollution)*." Participants did not receive any information pertaining to air pollution or climate change, and for all three topics, participants were instructed to indicate their own personal views while responding to survey questions. For each environmental topic it was also emphasized that there were no right or wrong answers: only interest in personal opinions and beliefs about the issues.

Personal Relevance and Knowledge of Environmental Topics

In addition to asking participants about their perceptions of threat and resulting motivation for taking action regarding the environmental topics surveyed, items assessing how personally relevant and knowledgeable participants felt regarding each of the three issues were also included in questionnaire booklets. Participants responded to each of the following questions: "*How personally relevant are these environmental issues [air pollution, climate change, loss of biodiversity] to you?*", and "*How knowledgeable do you feel about these environmental issues [air pollution, climate change, loss of biodiversity]?*", using 1 (*Not at all relevant to me*) to 7 (*Very relevant to me*), and 1 (*Not at all*) to 7 (*Very much*) scales, respectively. Sample means, standard deviations, correlations, and differences in responses to these questions based on the issue are shown in Table 4. Overall, participants viewed air pollution ($M = 5.71$, $p < .05$) as the most

Table 4

Sample Means, Standard Deviations, and Correlations for Personal Relevance and Knowledge Pertaining to Environmental Topics

Environmental Topic	Personal Relevance	Knowledge of Issue	*r*
Air Pollution	5.71[a] (*SD* = 1.30)	4.55[a] (*SD* = 1.47)	.41*
Climate Change	4.53[b] (*SD* = 1.84)	4.21[b] (*SD* = 1.69)	.30*
Loss of Biodiversity	4.69[b] (*SD* = 1.56)	3.75[c] (*SD* = 1.68)	.53*

Note: * $p < .000$; Bivariate correlations within the table are between relevance and self-appraised knowledge for the environmental topic listed within a row; superscripts within each column for the two variables that share the same letter are not statistically different ($p > .05$).

important of the three environmental topics, with climate change ($M = 4.53$) and loss of biodiversity ($M = 4.69$) rated as equally relevant issues ($p > .05$). Participants also reported that they felt more knowledgeable about air pollution issues, relative to either climate change or loss of biodiversity ($Ms = 4.55$, 4.21, and 3.75, $ps < .05$), and relevance and knowledge were positively correlated across each of the three topics ($rs \geq .30$, $ps < .000$).

Theory of Planned Behavior Constructs

In accord with the Theory of Planned Behavior (TPB: Ajzen, 1985, 1991) model, items designed to measure the constructs of attitudes, social norms, perceived behavioral control, intentions, and behavior were included as part of the survey items contained in the questionnaire booklets. Participants responded to the TPB items following the items corresponding to the conceptual model dimensions for the given topic. Briefly, the TPB

postulates that behavior is determined by four primary constructs: attitudes toward the behavior(s) of interest, social norms or perceived pressure from others to perform the behavior(s), perceived behavioral control, or whether an individual feels they are capable and can exert some level of control over performing the behavior(s), and behavioral intentions to engage in action. Within the TPB framework, attitudes, social norms, and perceived behavioral control determine behavioral intentions, which in turn determines behavioral action (for reviews of the TPB, see Ajzen & Fishbein, 2005; Staats, 2003). Item construction of survey items measuring the TPB constructs followed guidelines suggested by Ajzen (2006).

Attitudes

For each environmental topic, participants responded to five items measuring attitudes toward performing proenvironmental behaviors using bipolar semantic adjective ratings (*harmful* - *beneficial*, *pleasant* - *unpleasant*, *good* - *bad*, *worthless* - *valuable*, *positive* - *negative*) on 1 to 7 scales (reverse-scored where appropriate; higher numbers indicating more favorable attitudes). Reliabilities for the attitude constructs across the three environmental topics were: Cronbach's α = .84, .88, and .86 for air pollution, climate change, and loss of biodiversity, respectively.

Social Norms

Social norms for performing proenvironmental behaviors pertaining to each of the three environmental topics consisted of four items (e.g., *"Most people who are important*

to me think that I should help do things about [air pollution, climate change, loss of biodiversity]"; *"I worry about what others might think if I don't help do things to reduce [air pollution, climate change, loss of biodiversity]"*; *"The people in my life whose opinions I value would approve of my behaviors that reduce [air pollution, climate change, loss of biodiversity]"*), using 7-point scales ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). Cronbach's α for air pollution, climate change, and loss of biodiversity were .72, .76, and .69, respectively.

Perceived Behavioral Control

The construct of perceived behavioral control was measured using three items per environmental topic. Example items included *"I have little control over being able to do anything about [air pollution, climate change, loss of biodiversity]"*, and *"There are obstacles beyond my control that prevent me from carrying out the behaviors that would reduce [air pollution, climate change, loss of biodiversity]"*, using scales ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). Cronbach's α ranged between .60, .68, and .66 for air pollution, climate change, and loss of biodiversity.

Behavioral Intentions

Behavioral intentions, the most proximate antecedent of behavior within the TPB, were measured using six items for air pollution (Cronbach's $\alpha = .90$), five items for climate change (Cronbach's $\alpha = .90$), and five items for loss of biodiversity (Cronbach's $\alpha = .90$). Example items for air pollution included *"I intend to take steps that will help*

reduce air pollution,*" "I plan to do things that will contribute to better air quality*,*" "I intend to do things like ride a bicycle or walk more frequently as a way to decrease air pollution problems*,*"* and *"I intend to decrease my automobile travel as a way to improve air quality"*. Example items measuring climate change intentions included *"I intend to take steps that will help reduce climate change*,*" "I plan to do things like donate time and/or money to organizations that address climate change issues*,*"* and *"To help prevent climate change I plan to reduce my carbon emissions by doing things like using automobiles less"*. Example items measuring loss of biodiversity intentions included *"I intend to take steps that will help reduce biodiversity problems*,*" "I plan to do things like donate time and/or money to organizations that protect wildlife habitat*,*"* and *"To help prevent the destruction of wildlife habitats I plan to purchase products from environmentally friendly companies"*. Participants indicated their intentions across each of the three environmental topics using 1 (*Very Unlikely*) to 7 (*Very Likely*) scales.

Proenvironmental Behavior

Behavior was measured using five items for each environmental topic. Example items for air pollution-related behaviors included *"I currently do what I can to contribute to reducing air pollution problems*,*" "I volunteer time and/or money to help take action reducing air pollution problems*,*" "I currently do things that help reduce air pollution, such as using public transportation and decreasing my automobile use*,*"* and *"I am proactive when it comes do doing things about air pollution"* (Cronbach's $\alpha = .87$). For climate change-related behaviors, example items included *"I try to do what I can to*

contribute to reducing climate change problems,*" "I volunteer some of my time to help take action reducing climate change problems*,*" "I currently do things that help reduce climate change, such as using automobiles less or using public transportation*,*"* and *"I am proactive when it comes to doing things about climate change"* (Cronbach's α = .88). Lastly, example items measuring loss of biodiversity-related behaviors included *"I try to do what I can to contribute to reducing biodiversity problems*,*" "I do things that help reduce biodiversity loss, such as donating money or my time to organizations that are involved with this issue*,*"* and *"I am proactive when it comes to doing things about biodiversity issues"* (Cronbach's α = .89). Responses to these items were made on 7-point scales ranging from 1 (*Never*) to 7 (*Always*).

CHAPTER 4

RESULTS

Overview of Data Analytic Strategy and Analyses

Data were analyzed using confirmatory factor analysis and structural equation modeling procedures within the program *Amos Version 17* (Arbuckle, 2008). The maximum likelihood estimation method was selected for all reported analyses; missing data were minimal and did not require corrective estimation methods. For all figures depicting structural models, the indicators (observed variables) for exogenous latent variables were each centered at their mean value (mean-centered) to facilitate interpretation and reduce multicollinearity (Kline, 2005). Unstandardized parameter estimates are reported in each figure, and a marker variable strategy for estimation was used for analyses.

Testing the Two-Factor Structure of the Conceptual Model Across Environmental Topics: Research Question 1

In order to first establish that the proposed conceptual model is a viable representation of environmental concern--that is, that perceived threat and desired change (motivation) constitute two discernable constructs--confirmatory factor analysis (CFA) was employed to test the a priori hypothesis that the two dimensions are related, though unique

psychological phenomena. Further, CFA analyses were performed as a check of measurement validity of the constructs. For each of the three environmental topics, two-factor measurement models were tested and evaluated for model fit using conventional structural equation modeling fit indices. Next, using the chi-square difference test for nested models, a single-factor solution of each environmental topic was tested against its two-factor model counterpart, thus providing a direct test of the statistical validity of the conceptual model for each environmental topic. Table 5 shows the results of the model fit indices and nested model comparisons. Across each of the three environmental topics, the analyses revealed that the two-factor model was a statistically significant improvement relative to the alternative single-factor solution ($\chi^2_{\text{Critical}} = 3.84$, $df = 1$, $ps < .05$). Perceived threat and desired change were strongly positively correlated across each of the three environmental topics ($rs = .86_{\text{air pollution}}$, $.93_{\text{climate change}}$, and $.90_{\text{loss of biodiversity}}$), suggesting considerable shared variance between the two dimensions ($r^2s = .73$ - $.86$). Despite these strong correlations, however, the analyses confirmed that participant's responses to the perceived threat and desired change items represent two discernable dimensions proposed in the conceptual model.

Testing the Presence of Latent Variable Interactions Among the Conceptual Model Dimensions, and Effects on Intentions and Behavior: Research Question 2

To test for latent variable interactions among the conceptual model dimensions, model-building procedures described by Marsh, Wen, and Hau (2006) were followed.

Table 5

Model Comparison of Confirmatory Factor Models

Model	Fit Indices								
	χ^2 (CMIN)	*df*	*p*-value	CFI	TLI	RMSEA [CI]	χ^2_{Δ}	$\chi^2_{\Delta df}$	χ^2_{Critical}
Air Pollution									
Two-Factor Structure	58.89	8	≤ .000	0.96	0.93	.11 [.09 - .14]	44.18*	1	3.84
Single-Factor Structure	102.98	9	≤ .000	0.93	0.88	.15 [.12 - .17]			
Climate Change									
Two-Factor Structure	31.55	8	≤ .000	0.98	0.97	.08 [.05 - .11]	30.77*	1	3.84
Single-Factor Structure	62.32	9	≤ .000	0.97	0.95	.11 [.08 - .14]			
Loss of Biodiversity									
Two-Factor Structure	30.93	8	≤ .000	0.98	0.95	.07 [.05 - .11]	22.10*	1	3.84
Single-Factor Structure	53.03	9	≤ .000	0.96	0.92	.10 [.07 - .13]			

Note: * $p < .05$

First, each observed variable for the latent variables perceived threat and desired change was centered at its mean, and then a third latent variable consisting of three observed variables was constructed based on the product of the centered indicators for perceived threat and desired change (a product-indicator model, or the constrained approach; see Kenny & Judd, 1984; Marsh et al., 2006 for a review). For example, the *harm* indicator corresponding to perceived threat was multiplied by the *importance* indicator corresponding to desired change in order to create the first observed variable of the interaction for air pollution, then the *danger* indicator of perceived threat was multiplied by the *upset* indicator of desired change, and so on, resulting in three product terms (i.e., three observed variables: *harm* × *importance*, *danger* × *upset*, and *worry* × *motivation*) for the latent variable interaction of each environmental topic. This resulted in three, three-factor CFA models. Each of the three, three-factor CFA models revealed that for each environmental topic the latent variables of perceived threat and desired change were interacting significantly (linear changes in perceived threat were accompanied by changes in desired change).

For each of the three environmental topics, statistically significant latent variances, residual variances (disturbances), correlations/covariances, and regression paths (λ's) were obtained (*ps* < .000). Model fit for the latent variable interaction models varied only slightly by topic: air pollution: χ^2 (CMIN) = 123.57, df = 24, $p \leq .000$; TLI = .91, CFI = .94, RMSEA = .09; climate change: χ^2 (CMIN) = 150.36, df = 24, $p \leq .000$; TLI = .92, CFI = .95, RMSEA = .10; and loss of biodiversity: χ^2 (CMIN) = 84.01, df = 24, $p \leq .000$; TLI = .93, CFI = .96, RMSEA = .07.

Given that latent variable interactions were obtained for each of the three environmental topics, and the measurement structures were acceptable, structural equation

models (SEM) were then tested. Figures 4, 5, and 6 show the structural models of perceived threat, desired change, and their interaction predicting intentions and proenvironmental behavior. Table 6 displays the model fit indices for each of the tested SEM models. Generally, the models across each environmental topic faired acceptable in terms of describing the data, as indicated by the fit indices in Table 6. Across each of the three models, TLI $\geq$ .90, CFI $\geq$ .92, RMSEA $\leq$ .09, suggesting reasonable, though not perfect fit of the data. Within the models, perceived threat, desired change, and the interaction had differential effects on intentions, and subsequently, behavior, depending upon the environmental topic. For air pollution, perceived threat had a negative average effect on intentions; desired change and the interaction had positive effects. These results suggest that perceived threat alone had a negative average effect on intentions, decreasing the likelihood of behavioral action, while desired change had an average positive effect. Further, the joint interaction of perceived threat and desired change exerted positive average effects on intentions, suggesting that perceived threat neglected to increase intentions in the absence of motivation. The interactive effects, however, increased intentions, as indicated by the parameter estimate for the interaction path. Intentions, in turn, positively predicted behavior. In terms of variance accounted for, the three latent variables accounted for 49.4% of the variance in intentions, while intentions accounted for 39.6% of the variance in proenvironmental behavior.

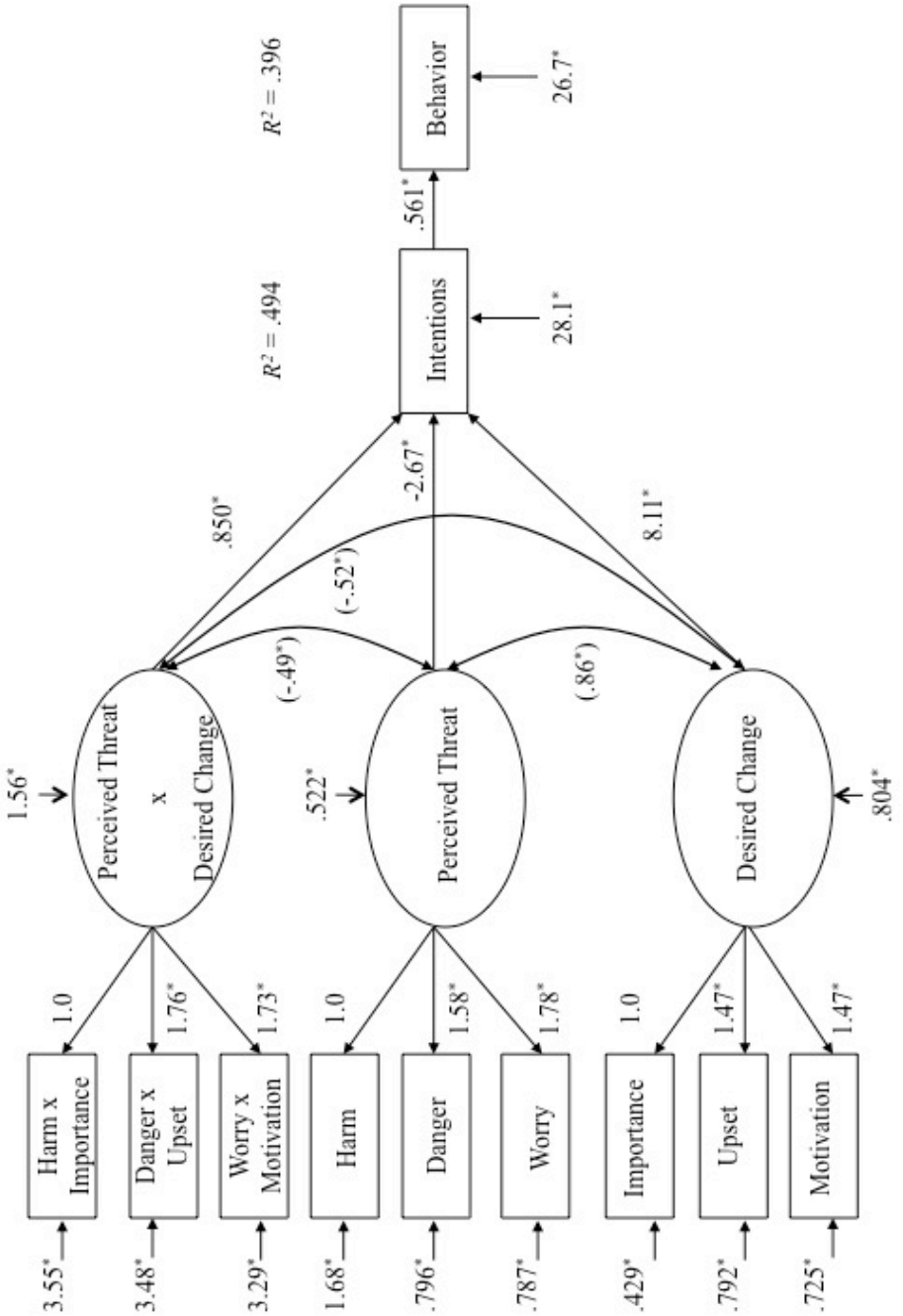

Figure 4: Structural equation model of perceived threat, desired change, and the interaction predicting proenvironmental intentions and behavior for air pollution. *Note*: All estimated model parameters * $p < .01$; unstandardized parameter coefficients are reported; residual variances for the observed variables are reported in the R^2 - 1 metric; correlations among latent variables are shown in parentheses; see Table 1 for exact phrasing of questions corresponding to the observed variables as well as descriptive statistics.

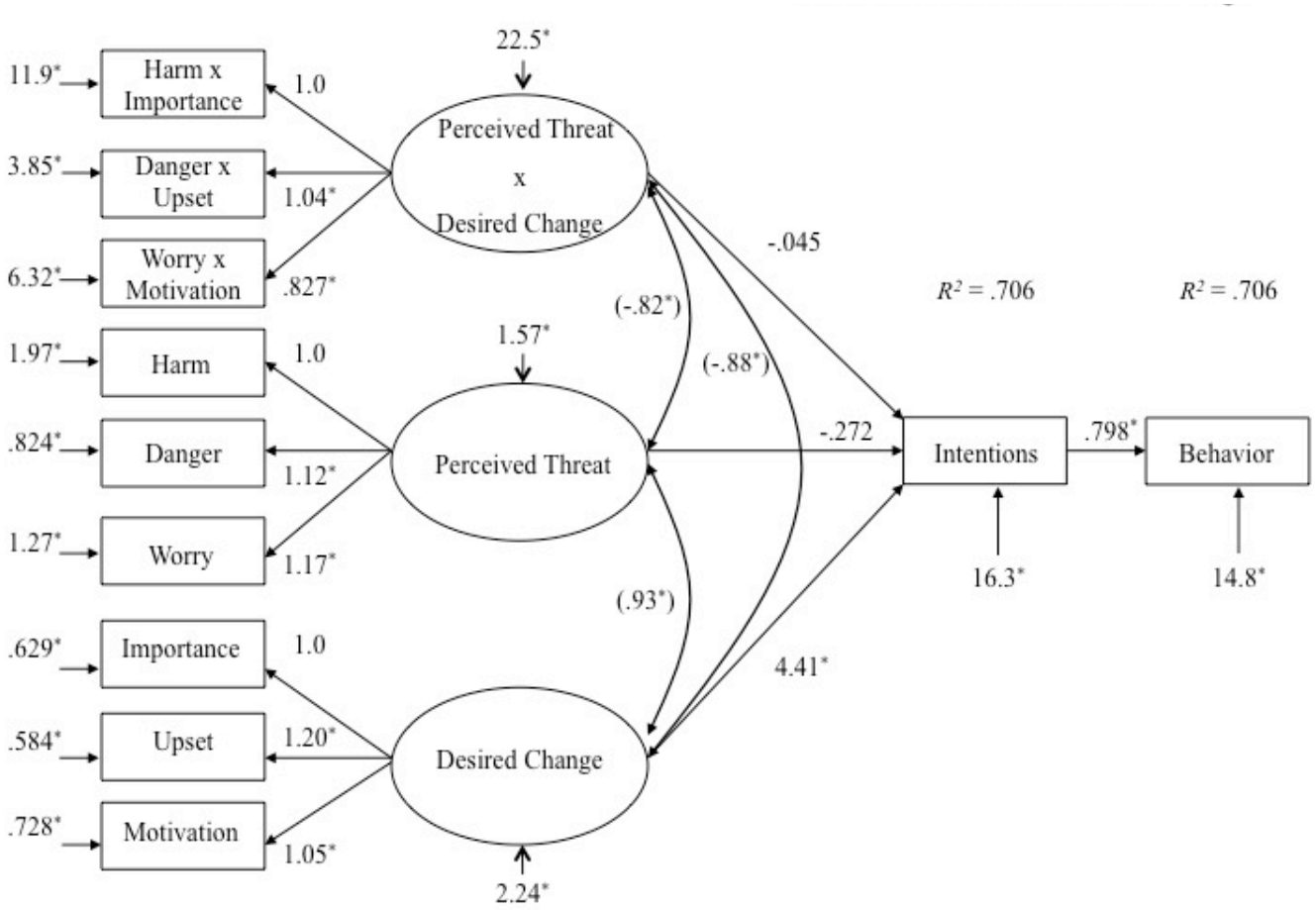

Figure 5: Structural equation model of perceived threat, desired change, and the interaction predicting proenvironmental intentions and behavior for climate change. *Note*: All estimated model parameters *zpz<. 01; unstandardized parameter coefficients are reported; residual variances for the observed variables are reported in the R^2 - 1 metric; correlations among latent variables are shown in parentheses; see Table 2 for exact phrasing of questions corresponding to the observed variables as well as descriptive statistics.

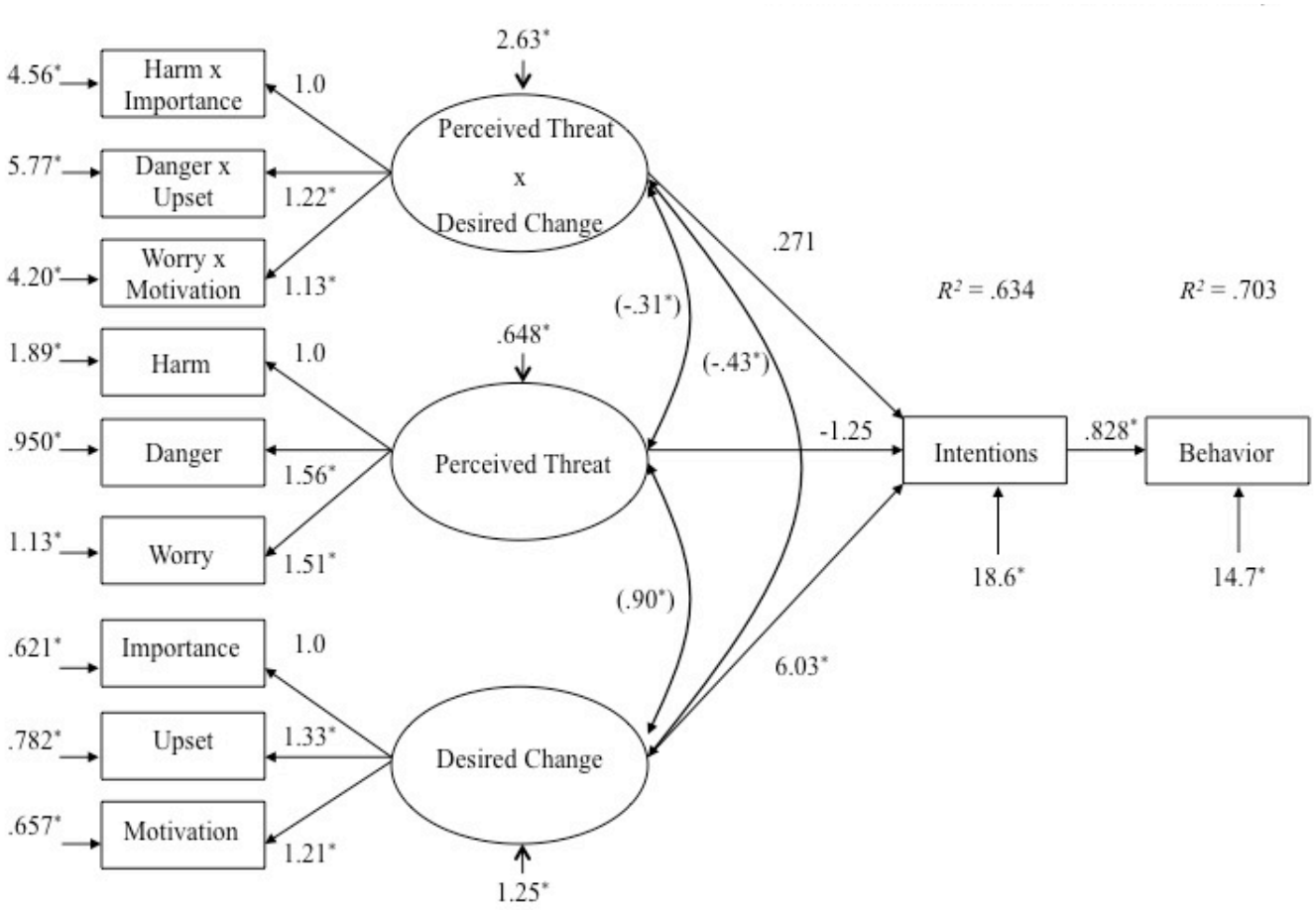

Figure 6: Structural equation model of perceived threat, desired change, and the interaction predicting proenvironmental intentions and behavior for loss of biodiversity. *Note*: All estimated model parameters *zpz<. 01; unstandardized parameter coefficients are reported; residual variances for the observed variables are reported in the R^2 - 1 metric; correlations among latent variables are shown in parentheses; see Table 3 for exact phrasing of questions corresponding to the observed variables as well as descriptive statistics.

Table 6

Measures of Model Fit for Structural Equation Models

Model	Fit Indices						
	χ^2 (CMIN)	*df*	*p*-value	CFI	TLI	RMSEA [CI]	AIC
Air Pollution (Figure 4)							
Threat + Mot. + Threat×Mot.→Int.→Beh.	204.52	39	≤ .000	0.92	.90	.09 [.08 - .11]	280.52
Climate Change (Figure 5)							
Threat + Mot. + Threat×Mot.→Int.→Beh.	189.89	39	≤ .000	0.95	.93	.09 [.07 - .10]	265.89
Loss of Biodiversity (Figure 6)							
Threat + Mot. + Threat×Mot.→Int.→Beh.	177.49	39	≤ .000	0.94	.91	.08 [.07 - .10]	253.91
Air Pollution							
Threat→Mot.→Int.→Beh.	134.17	19	≤ .000	0.93	.91	.11 [.09 - .13]	184.17
Climate Change							
Threat→Mot.→Int.→Beh.	67.4	19	≤ .000	0.98	.97	.07 [.05 - .09]	117.4
Loss of Biodiversity							
Threat→Mot.→Int.→Beh.	114.46	19	≤ .000	0.96	.92	.10 [.08 - .12]	164.46
TPB *Air Pollution*	288.25	72	≤ .000	0.89	.85	.08 [.07 - .09]	382.25
TPB *Climate Change*	287.35	72	≤ .000	0.93	0.9	.08 [.07 - .09]	381.35

Table 6

Continued

Model	Fit Indices						
	χ^2 (CMIN)	*df*	*p*-value	CFI	TLI	RMSEA [CI]	AIC
TPB *Loss of Biodiversity*	293.22	72	≤ .000	0.91	0.88	.08 [.07 - .09]	387.22
Air Pollution (Figure 7)							
Threat + Mot. + Threat×Mot.+ TPB→Int.→Beh.	715.95	211	≤ .000	0.88	.85	.07 [.06 - .07]	891.95
Climate Change (Figure 8)							
Threat + Mot. + Threat×Mot.+ TPB→Int.→Beh.	712.33	211	≤ .000	0.92	.90	.07 [.06 - .07]	888.33
Loss of Biodiversity (Figure 9)							
Threat + Mot. + Threat×Mot.+ TPB→Int.→Beh.	691.37	211	≤ .000	0.9	.87	.07 [.06 - .07]	867.37

Note: Threat = Perceived Threat; Mot. = Desired Change (Motivation); Threat×Mot. = Latent Variable Interaction of Perceived Threat and Desired Change (Motivation); Int. = Intentions; Beh. = Behavior (self-reported); TPB = Theory of Planned Behavior; CMIN = Likelihood Ratio Chi-Square; *df* = Degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; [CI] = 90% Confidence Interval; AIC = Akaike Information Criteria

Divergent results were obtained when testing the models for climate change and loss of biodiversity. For both topics, neither perceived threat, nor the interaction of perceived threat and desired change significantly predicted intentions. The only significant predictor of intentions obtained in these models was desired change. That is, only the average motivation for taking action significantly predicted intentions to perform proenvironmental behavior. For climate change, the average effect of desired change on intentions explained 70.6% of the variance, which in turn explained 70.6% of the variance in behavior. Similarly, the average effect of desired change on intentions for loss of biodiversity explained 63.4% of the variance, which accounted for 70.3% of the variance in behavior. Regardless of the environmental topic, intentions significantly predicted behavior, though whether perceived threat, desired change, and the interaction predicted intentions depended upon the specific environmental problem.

Testing the Effect of Perceived Threat on Desired Change, and Effects on Intentions and Behavior: Research Question 3

Perceived threat appeared to have differential effects on intentions depending upon the environmental topic; desired change, on the other hand, was observed to have significant effects on intentions regardless of the environmental problem. An important question, therefore, is to what extent perceived threat accounts for an individual's motivation to enact action. Within the conceptual model, perceived threat and desired change are theorized to be two fundamental dimensions of environmental concern, and knowing to what extent the source of an individual's motivation stems from perceptions of threat, relative to perhaps other unmeasured sources, would be theoretically meaningful, and further expand knowledge

regarding the effects threat has on motivation relating to environmental problems. In order to test whether perceived threat explained variance in individual's motivation for taking action, and how motivation then affects intentions and behavior, SEM models estimating these relationships were tested.

Across each of the environmental topics, perceived threat was a significant, positive predictor of individual's motivation (*ps* < .01). Motivation, in turn, significantly predicted intentions, also positively, which predicted increases in proenvironmental behavior (*ps* < .01). Perceived threat explained substantial proportions of variance in individual's motivation for each of the three topics (R^2s = $.70_{\text{air pollution,}}$ $.87_{\text{climate change,}}$ and $.81_{\text{loss of biodiversity}}$), with motivation in turn explaining significant variance in intentions (R^2s = $.44_{\text{air pollution}}$, $.69_{\text{climate change}}$, and $.81_{\text{loss of biodiversity}}$) and behavior ($R^2s$ = $.39_{\text{air pollution}}$, $.70_{\text{climate change}}$, and $.70_{\text{loss of biodiversity}}$). Further, these SEM models exhibited reasonable fit in terms of describing the data (Table 6). Perceived threat appears to account for large portions of variance in motivation-related beliefs, and these beliefs are significant predictors of intentions and proenvironmental behaviors pertaining to these environmental problems.

Testing the Effect of Perceived Threat on Desired Change, and Effects on Intentions and Behavior: Research Question 4

The final question examined in the current study was the extent to which the dimensions of the conceptual model could be integrated with constructs from the well-established TPB framework and to explore how each of the constructs uniquely affected intentions and proenvironmental behavior. The testing of such models might provide important theoretical information about the relative effects these constructs exert on

intentions, and integration of the conceptual model dimensions with the TPB framework may reveal relationships not accounted for by either model alone. To address this question, first the traditional TPB model was tested in order to verify measurement and structural relations among constructs. Model fit indices of the CFA models for attitudes, social norms, and perceived behavioral control, while lower relative to the conceptual model indices, were each within acceptable conventions across each of the environmental topics. For air pollution, χ^2 (CMIN) = 195.07, $df = 51$, $p \leq .000$; TLI = .86, CFI = .91, RMSEA = .07; climate change, χ^2 (CMIN) = 218.77, $df = 51$, $p \leq .000$; TLI = .89, CFI = .92, RMSEA = .08; and loss of biodiversity, χ^2 (CMIN) = 197.03, $df = 51$, $p \leq .000$; TLI = .87, CFI = .91, RMSEA = .07. Correlations among attitudes and social norms ranged between .35, .49, and .27 for air pollution, climate change, and loss of biodiversity, while correlations between attitudes and perceived behavioral control were -.32, -.44, and -.13, and correlations between social norms and perceived behavioral control were -.42, -.49, and -.40 ($ps \leq .02$).

Model fit indices of the structural models for the TPB framework are shown in Table 6. The analyses revealed that the models were generally acceptable in terms of fit. Across each of the environmental topics, attitudes and social norms positively predicted intentions, while perceived behavioral control negatively predicted intentions (as perceptions of little control and obstacles hindering action increased, intentions significantly decreased). Intentions, in turn, positively predicted proenvironmental behavior, regardless of the environmental topic. The constructs of attitudes, social norms, and perceived behavioral control accounted for varying portions of variance, with 40.6% of the variance in intentions for air pollution, and 39.6% of the variance in proenvironmental behavior. For climate change, these constructs accounted for 62.5% of the variance in intentions, which then

accounted for 70.6% of the variance in proenvironmental behavior. Lastly, for loss of biodiversity, attitudes, social norms, and perceived behavioral control accounted for 56.7% of the variance in intentions, which then explained 70.2% of the variance in proenvironmental behavior.

After establishing sufficient measurement and structural relations among the conceptual model dimensions, as well as the TPB constructs, integrated models combining all constructs were tested. Figures 7, 8, and 9 show the parameter estimates of these models for each of the environmental topics. Table 6 presents the model fit indices. Across each of the three environmental issues, the relative average effect of these constructs varied considerably. In terms of significant predictors of intentions, only desired change and perceived behavioral control significantly predicted air pollution-related responses. Neither perceived threat, the interaction of perceived threat and desired change, attitudes, nor social norms significantly predicted intentions. In addition, desired change and perceived behavioral control accounted for 52.4% of the variance in intentions, which in turn explained 39.5% of the variance in proenvironmental behavior.

The analyses revealed a different set of results for climate change, as well as loss of biodiversity. For climate change, only the constructs of desired change, social norms, and perceived behavioral control were significant predictors of intentions, accounting for 77% of the variance, which in turn explained 70.6% of the variance in proenvironmental behavior. Loss of biodiversity also possessed different predictors of intentions, with desired change, attitudes, social norms, and perceived behavioral control each significantly contributing to variance in intentions. These four constructs explained 70.4% of the variance in intentions, while intentions in turn accounted for 70.2% of the variance in proenvironmental behavior.

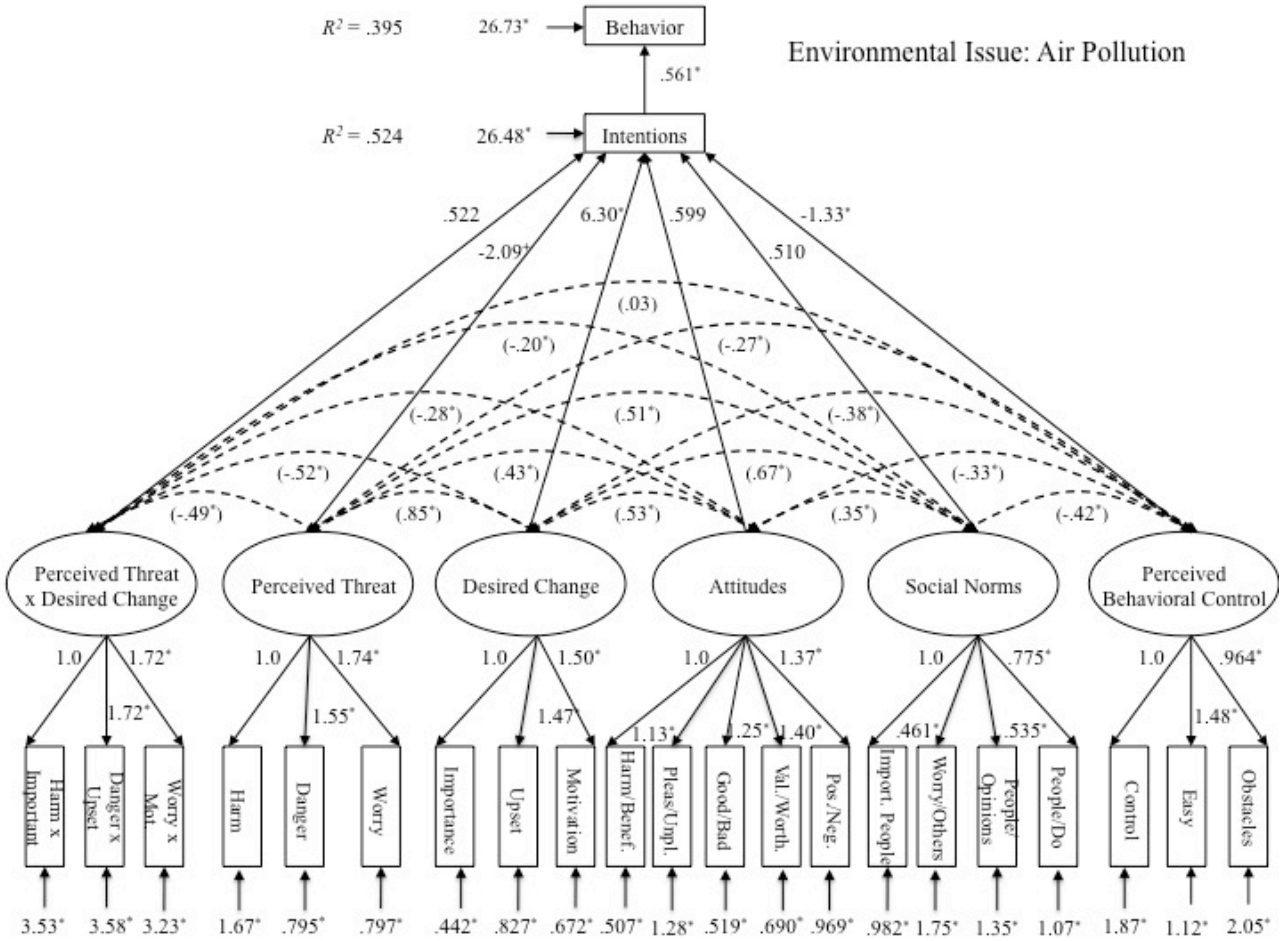

Figure 7: Structural equation model of integrated conceptual model dimensions and theory of planned behavior constructs for air pollution. *Note*: All estimated model parameters * $p <$. 01; + p = .09; Unstandardized parameter coefficients are reported; Residual variances for the observed variables are reported in the R^2 - 1 metric; correlations among latent variables are shown in parentheses, indicated by segmented lines.

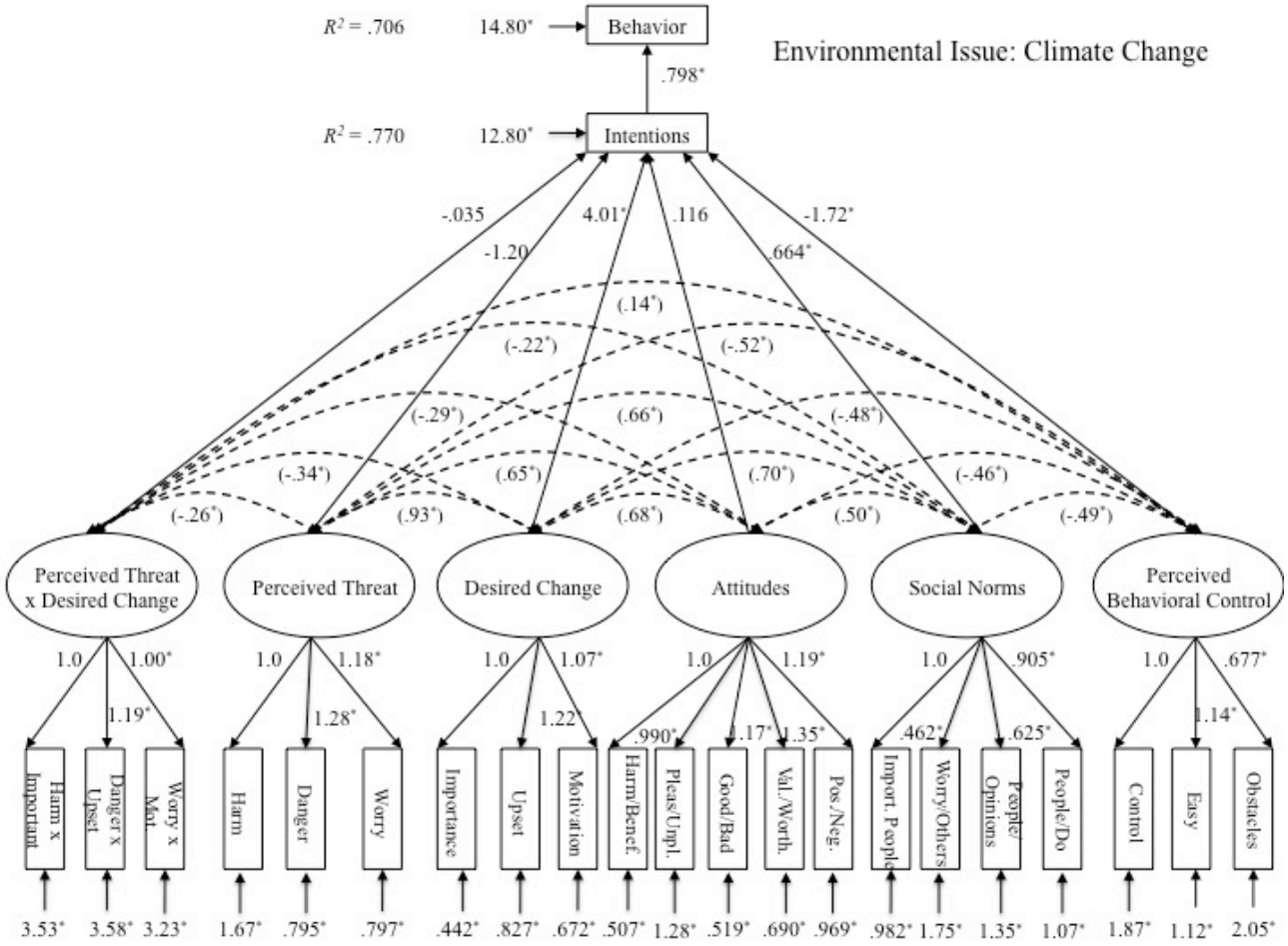

Figure 8: Structural equation model of integrated conceptual model dimensions and theory of planned behavior constructs for climate change. *Note*: All estimated model parameters * $p <$. 01; Unstandardized parameter coefficients are reported; Residual variances for the observed variables are reported in the R^2 - 1 metric; correlations among latent variables are shown in parentheses, indicated by segmented lines.

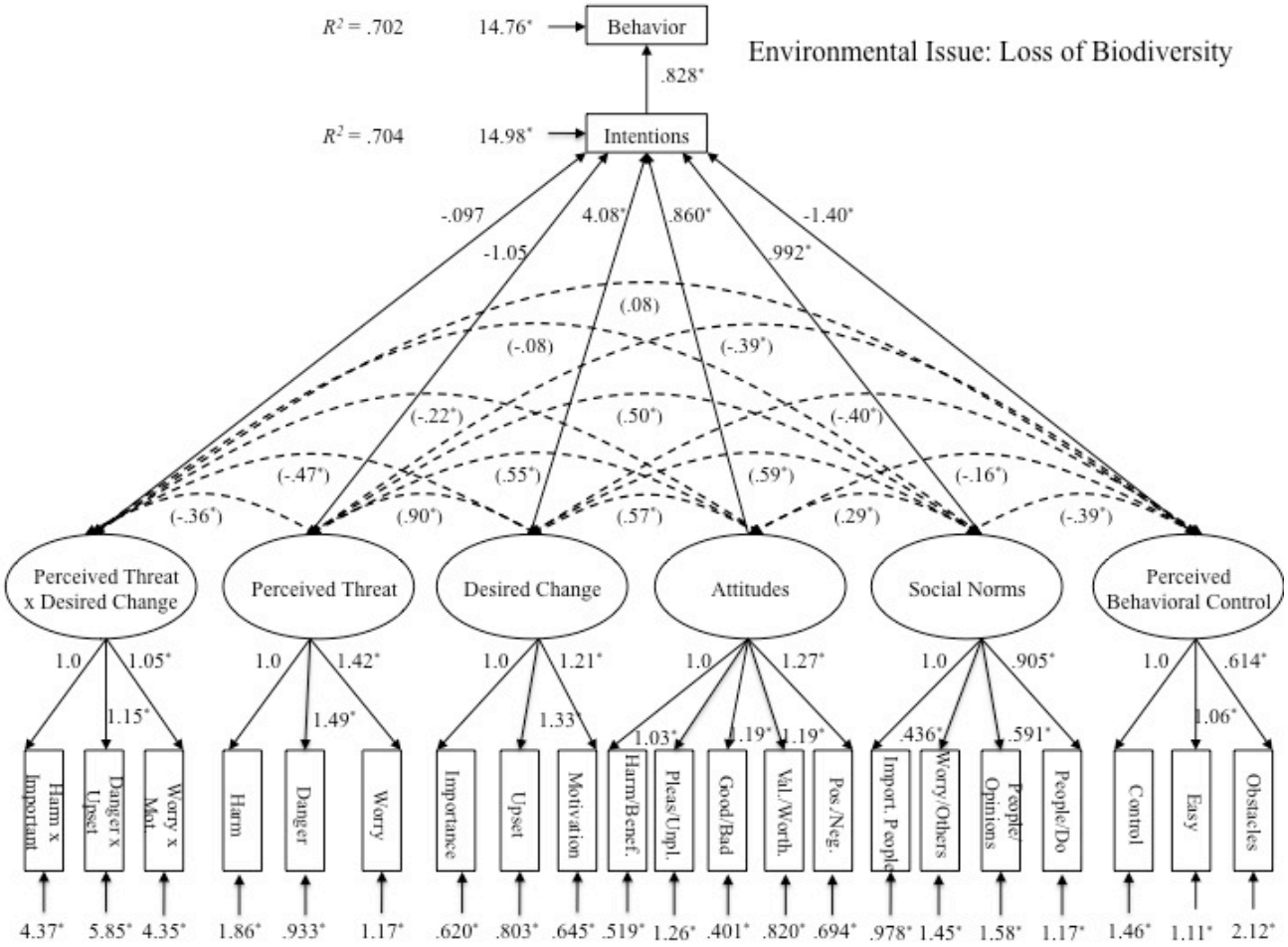

Figure 9: Structural equation model of integrated conceptual model dimensions and theory of planned behavior constructs for loss of biodiversity. *Note*: All estimated model parameters * $p <$ .01; Unstandardized parameter coefficients are reported; Residual variances for the observed variables are reported in the R^2 - 1 metric; correlations among latent variables are shown in parentheses, indicated by segmented lines.

In summary, these integrated models revealed that each of the three environmental issues possesses different behavioral predictors, with the relative weight of the constructs varying according to the particular environmental issue examined.

CHAPTER 5

CONCLUSIONS

Discussion

In the present study is has been proposed that environmental concern can be understood within a conceptual model that emphasizes two psychological phenomena: perceived threat stemming from environmental issues, and the degree of desired change or motivation that individuals possess for taking action directed at environmental problems. The results of the present research provide preliminary support for the utility of conceptualizing environmental concern as a psychological barometer or gauge in which individuals consider the threatening aspects of an environmental problem, which in turn can affect their subsequent motivations for action. As the results of the present study have revealed, an individual's level of perceived threat as well as their motivation for action can exist independently, yet these dimensions can also interact, predicting behavioral intentions, and subsequently proenvironmental behavior, offering insights into how these constructs are implicated in environmentally consequential behavior. This picture, however, is more complex than it initially appears.

First, it appears that for an environmental issue that is perceived as highly personally relevant, in the current research, the environmental problem of air pollution, the interaction of perceived threat and motivation is more impactful than when the

environmental problem under consideration is perceived as less personally relevant, as was found with the issues of climate change and loss of biodiversity. For air pollution, it was found that perceived threat alone had a negative effect on intentions, while motivation increased intentions to take action. Yet, when perceived threat and motivation were considered in tandem as interacting agents, intentions significantly increased. This finding is intriguing because it suggests that threat in the absence of motivation is detrimental for intentions, yet when threat interacts with motivation, the likelihood of an individual forming behavioral intentions increases, which can translate into proenvironmental behavior. For the environmental problem of air pollution, these constructs accounted for considerably high portions of variance in intentions (49.4%), which in turn explained 39.6% of the variance in proenvironmental behaviors.

With regard to climate change and loss of biodiversity, the relationships among perceived threat and motivation appear more complicated in terms of predicting intentions and pro-environmental behavior. Analyses revealed that for both of these issues, motivation was the most consequential predictor. Indeed, neither perceived threat nor the latent variable interaction with motivation significantly predicted intentions. Motivation, however, accounted for substantial portions of variance in intentions across both issues (70.6% and 63.4% for climate change and loss of biodiversity, respectively). Moreover, individual's intentions explained considerable variance in proenvironmental behavior across these two issues (70.6% and 70.3%). Why might this be? It is likely that neither climate change nor loss of biodiversity were perceived as personally involving enough to be considered threatening environmental problems, highlighting the moderating effect that personal relevance may have on these constructs. As the ratings of

personal relevance demonstrated, air pollution was rated as the more focal issue, with climate change and loss of biodiversity viewed as less, though equally relevant issues. Their relative mean ratings, though above the midpoint of the scale, suggested perhaps a moderate level compared to the higher level of air pollution. This perceived moderate relevance of climate change and loss of biodiversity versus a higher level being perceived for air pollution, however, might have been the driving variable in affecting individuals' perceptions of threat. In addition, individuals reported that air pollution was by far the most threatening issue, followed by loss of biodiversity, with climate change reported as the least threatening of the three environmental problems. Similarly, individuals reported they were more motivated to take action for first, the problem of air pollution, then loss of biodiversity, and lastly, climate change.[2]

These findings are theoretically intriguing because they suggest that in order for an individual to feel threatened by an environmental problem they must also view the problem as personally involving (or, alternatively, threat increases the relevance of the problem). Yet, even for environmental issues that are less personally involving, other psychological mechanisms aside from threat per se can affect intentions, and

[2] These findings are also illuminating for showing the urgent need for increased awareness of environmental problems that have not only local, but broad, global implications. If one interprets the relative importance assigned to these issues, as indicated by the ratings of personal relevance, perceived threat, and motivation, it is clear that not all environmental problems are concerning in the mind of most individuals, at least not in these sample data. Some environmental problems take on a greater priority and perhaps more immediate sense of urgency than others, which is consistent with experience-based accounts of why environmental problems like global warming do not alarm most individuals (e.g., Weber, 2006). Environmental problems such as air pollution are more directly visible and experienced, while problems such as climate change and biodiversity loss are less known due to their unobvious effects. With the forecasted negative effects of environmental problems such as climate change and continued biodiversity loss becoming closer to the reality of many scientists' predictions, increased public awareness and education are reminders of an agenda in need of continued attention.

subsequently proenvironmental behaviors. Desired change, operationalized as an individuals' motivation within the conceptual model, does not seem to always operate in conjunction with threat, though threat was found to account for substantial variance in individuals' reported motivation, suggesting that threat is a major source of individuals' impetus for action. For environmental issues that are less personally involving, and less threatening, motivation can still play an important role in affecting proenvironmental intentions and behavior. Irrespective of the effects that threat can contribute, motivation still exerts significant effects on intentions. Based on findings in the present study, further examination of the relationship between perceived threat and motivation are needed in order to more fully understand how and when threat is implicated in affecting individuals' motivation for proenvironmental action. At present, it can tentatively be proposed that perceived threat, for highly personally relevant environmental issues, has negative effects on intentions in the absence of motivation, yet threat interacting with motivation can result in increased intentions to take action, and subsequently increase proenvironmental behavior.

One possible reason for this finding is that at higher levels of threat motivation stays more or less constant due to the importance or urgency placed on the issue by the individual. That is, when the environmental problem presents perceived consequences that are threatening to one's well-being or interests, more energy is placed on reacting in a proactive manner. Higher levels of threat, which were associated with greater personal relevance, appear to accompany increased motivation. In other words, threat and motivation can parallel one another to the extent that they pertain to a personally cared about issue involving the self. At greater levels of threat, where increased motivation to

take action occurs, individuals exhibit greater propensities to engage in environmentally friendly intentions, and consequently, behaviors. Conversely, at lower levels of threat, and lower relevance, where the impacts of threat are less pronounced, threat alone becomes an unimportant factor in affecting an individual's intentions and behavior, but individuals can, instead, draw upon motivation, still leading to intentions, and proenvironmental behavior. Threat may be sufficient for affecting motivation when the environmental problem is cared about, but it does not appear to be necessary, at least not when self-relevance for the issue is lacking, as data in the current study suggest. These findings may suggest different thresholds for when threat exerts effects on motivation, though further empirical research examining this question in the context of experimental designs that permit conclusive causal relationships between perceived threat, motivation, and personal relevance pertaining to the issue are needed to support findings.

It is interesting, however, that in the present study perceived threat, independent of motivation, had a negative effect on intentions for the environmental problem of air pollution. For the most threatening of the three environmental problems examined, and the issue rated as the most personally relevant, perceived threat decreased intentions to take behavioral action. Unlike previous studies where self-reported threat has been found to positively, though weakly, predict environmental practices (Baldassare & Katz, 1992), findings from this study revealed that perceived threat alone had opposite effects. This discrepancy may stem from several factors, such as differences in the environmental problems investigated, as well as differences in the measurement of threat. For example, Baldassare and Katz (1992) used only a single item asking about the perceived

personal threat of air pollution and water pollution combined, whereas in the current study perceived threat was measured separately for each of the three environmental problems, and was operationalized as individuals' reported perceptions of harm, danger/severity, and worry associated with the problem. It is likely that these differences in measurement tap different phenomena, or simply that the latter provides a more precise measure of threat, though it is still nonetheless interesting that perceived threat resulting from air pollution appears to prevent action, at least when motivation is absent. This finding may help shed light on why many individuals choose to not engage in proenvironmental action when threatened by the negative effects of some environmental problems. Perceived threat appears to have the ability to forestall action until sufficient motivation also accompanies such beliefs. When this occurs, perceived threat and the individual's motivation then support proactive courses of action. The negative effect of perceived threat on intentions may reflect underlying emotions such as fear or dread, as well as beliefs of uncontrollability, which can lead individuals to abstain from action when threats are viewed from a risk perspective (e.g., Slovic, 1987).

Aside from the current research providing initial support for the proposed conceptual model, and also revealing the psychological connection of perceived threat and desired change, in relation to intentions and proenvironmental behavior, perhaps the equally interesting findings are those that pertain to the results obtained for the integrated models where perceived threat and desired change effects were examined in the context of other constructs known to predict a variety of behavioral outcomes. The results based on the integrated models suggested that at least one dimension of the conceptual model,

desired change, consistently predicted intentions, as did perceived control, and that attitudes and social norms had differential effects depending upon the environmental issue. For air pollution, only an individual's motivation and perceptions of control significantly predicted intentions, which in turn predicted proenvironmental behavior. Climate change-related intentions, however, were significantly predicted by not only the individual's motivation and perceptions of control, but also social norms for performing the proenvironmental behaviors. Similarly, loss of biodiversity-related intentions were predicted by these three constructs, as well as a fourth, attitudes. In each model, these constructs accounted for significant portions of variance in intentions, ranging from 52.4% to 77% variance explained across each of the three topics. Intentions, in turn, explained between 39.5% and 70.6% of the variance in proenvironmental behavior.

What do these findings suggest? It is not surprising that perceptions of a lack of control significantly predicted intentions, regardless of the environmental topic, given that a major determinant of an individual's intentions depends on whether the individual believes they are able to carry out the desired actions, as well as confront perceived obstacles or barriers. Rather, the more difficult findings for explanation are those that deal with the differing effects of attitudes and social norms. For air pollution, attitudes and social norms were likely not influential due to the salience of the problem, as indicated by participant's ratings of perceived threat, personal relevance, and self-appraised knowledge. Indeed, air pollution was rated as the highest personally relevant or cared for issue, as well as the issue that participants reported possessing the greatest amount of knowledge for and felt most threatened by. It is likely that participants

were simply so knowledgeable and familiar with the issue that their attitudes and any perceived social pressures were less directive in affecting their intentions, and resulting proenvironmental behaviors.

Regarding climate change and loss of biodiversity, the results suggest that social norms were equally influential in affecting intentions, but for climate change, attitudes were not a significant predictor. Each of these findings, the relative impact of attitudes and social norms across the three environmental problems, is intriguing, though pinpointing exactly why these effects were observed is difficult given that these effects were not anticipated and uncovering possible explanations for these effects was not an intended a priori goal of the study. Rather, the purpose of testing these integrated models was to explore the relative impact of each construct on intentions and to examine whether dimensions of the conceptual model offered unique prediction even when other variables were taken into account. According to the TPB framework, the relative impact of attitudes, social norms, and perceived control depends upon the behavior(s) investigated, as well as the specific population studied (Ajzen, 2010). Low reliability in measurement of the TPB constructs, which can attenuate prediction of structural relations, seems unlikely given that the fit indices from the measurement models were within reasonable ranges of fit.

A more plausible explanation, as suggested by Ajzen (2010), is that the behaviors associated with each environmental problem possess different (and unmeasured in the current study) background variables moderating the relations between attitudes, social

norms, and intentions.[3] For example, applications of the TPB model to environment-related intentions and behavior have shown that individual-level variables such as one's environmental activist identity (Fielding, McDonald, & Louis, 2008) and affective connection to nature (Hinds & Sparks, 2008), as well as broader, cultural values (Oreg & Katz-Gerro, 2006) can affect the comparative impacts that attitudes, social norms, and perceived control exert on intentions. Identification with environmental issues, issue-specific beliefs, political views, and other background factors are all likely contributors requiring future investigation. Importantly, however, the present research has

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[3] This possibility was explored post hoc in the current study by examining the extent to which self-appraised knowledge for the issues could help explain the differential effects of attitudes and social norms on intentions. Specifically, the sample data were divided into low and high knowledge groups using a median split. Then the integrated models (Figures 7, 8, and 9) were retested in order to determine whether knowledge moderated any of the predictive relationships. These analyses, however, proved difficult to conduct for several reasons. First, for air pollution, a disproportionate segment of the sample fell into the low knowledge group (n = 102), relative to the high knowledge group (n = 351), precluding testing of the integrated model due to insufficient statistical power and unequal variance estimates. This also occurred when investigating the moderating effect of knowledge for climate change. A median split revealed again a disproportionate number of participants who reported low (n = 153) relative to high (n = 299) knowledge for the issue, precluding testing of the integrated model. Loss of biodiversity, however, possessed low (n = 198) and high (n = 255) knowledge groups of closer sample sizes. The retested integrated model for this topic revealed that for low knowledge participants, only social norms and perceived control significantly predicted intentions. For high knowledge participants, desired change, attitudes, and perceived control significantly predicted intentions. These analyses suggest that among those who self-reported low knowledge for the issue, social norms and perceived barriers were the major determinants of intentions (social norms positively predicted intentions, perceived control negatively predicted intentions), while for high knowledge groups, motivation, attitudes, and perceived control were the more consequential predictors (motivation and attitudes positively predicted intentions, perceived control exhibited negative prediction of intentions). Thus, attitudes were predictive to the extent that high levels of self-appraised knowledge was present, though it is unclear what specific content underlie such knowledge since it was not measured in the current study. Similar difficulties pertaining to statistical power were observed when investigating the moderating role of personal relevance. When participants were divided into low and high relevance groups based on each of the three environmental topics, even greater sample size discrepancies were obtained. For air pollution, only 36 participants could be classified within a low relevance group, whereas 416 resulted in the high relevance group. For climate change and loss of biodiversity, sample sizes were n = 131 and n = 99 for the low relevance groups, and n = 322 and n = 354 for the high relevance groupings, respectively.

provided direct empirical replication of TPB findings, demonstrating that the TPB model can be fruitfully applied within the domain of understanding proenvironmental behavior.

In light of the results obtained in the current study, and the ideas suggested, an important question to ask is what does the proposed conceptual model afford in terms of increasing an understanding of environmental concern? First, the proposed conceptual model is based on conceptual and theoretical themes of past approaches taken by researchers who investigate concern-behavior relations. Traditionally, concern has been conceptualized (and measured) as attitudes, values, or both, limiting the expression of concern to theoretical perspectives that lack an integrative framework. The proposed conceptual model attempts to organize and coherently explain mechanisms of this expression. That is, the conceptual model put forth in the present paper is a preliminary attempt at beginning a new focus on two dimensions of environmental concern that are empirically understudied, though often implicitly assumed, which may help inform and generate theory of concern-behavior relations. The proposed model also offers clarification and specificity in the operationalization of constructs, and provides a revised and expanded definition of concern (see Introduction).

Second, the conceptual model provides a practical tool for further exploring threat-motivation links with regard to environmental behaviors. The emphasis within the model on perceived threat and individual motivation, as they relate to proenvironmental behavior, is not intended to represent the only dimensions of environmental concern, nor is the proposed model suggested to explain all concern-behavior phenomena. Rather, the conceptual model should be thoughtfully and logically applied when the goal is to

understand how perceived threat and motivation are implicated in environmental behaviors, and why individuals react as they do when faced with various environmental problems that may or may not be believed to be of much consequence to one's daily life and interests. Discerning further moderating and mediating variables that aid in explaining people's cognitive, emotional, and behavioral reactions to environmental problems are important areas of research that may further elaborate and verify the utility of the conceptual model.

A related question of the current research pertains to evaluating the best fitting model of the data given the models tested. As revealed in the analyses, shown in Table 6, generally each of the tested SEM models fared acceptable in terms of describing the data, though the analyses also suggested that this evaluation is largely dependent upon the particular fit indices one considers. For example, the likelihood ratio or model chi-square was statistically significant for each tested model. This fit index is typically considered an important criterion for evaluating the overall model fit of a data structure, where retaining the null reflects goodness of the model fitting the data. Other fit indices such as CFI, TLI, and RMSEA varied with the specific models tested.

Which models, then, are the better descriptors of the data? Determining which fit indices reflect the best fitting model is largely a controversial and unsettled debate among many statisticians, with traditional guidelines of model fit being challenged and corrected regularly, and it is instructive to not rely solely on a single fit index, and instead consider the overall pattern of findings and the substantive meaning of model effects in the context of the goals of the research, and the implications such models might offer for theoretical and practical purposes. In other words, there is no single measure of model fit, but many

which can each reveal different types of information pertaining to the data and phenomena of interest.

For example, in the current study the fit indices suggested that the proposed conceptual model (Figures 4, 5, and 6) described the data slightly better than the TPB models, as evidenced by the CFI and TLI measures of model fit. In terms of RMSEA, however, the TPB models fared slightly better. The Akaike Information Criterion, or AIC, suggested that the most parsimonious models were those in which perceived threat was specified to predict desired change, which in turn predicted intentions and proenvironmental behavior (Research Question 3). The AIC measure of model fit also revealed that the proposed conceptual model faired better as a parsimonious fit to the data relative to the TPB and integrated models (Figures 7, 8, and 9), but not as well as the models where perceived threat predicted desired change. These comparisons, based on the AIC measure of fit, are useful for interpreting which models were the most parsimonious descriptors of the data, but it is also important to recognize that each estimate of model fit reported in Table 6 provides different information about the relations among constructs, and no one model is the sole descriptor of the data. These findings highlight the complexity of constructs affecting proenvironmental behavior.

Limitations and Directions for Future Research

Findings of the present study have provided encouraging support for the validity and utility of the proposed conceptual model, though several limitations must also be acknowledged, and further research is needed in order to better understand these dimensions of environmental concern. Though driven by a theoretical framework, based

on themes of the two traditional approaches outlined in the Introduction, data from the current study were survey and correlation-based, and were acquired using a convenience sample of college students that may have limited generalizability. Additional research that incorporates experimental methodologies using diverse populations are needed in order to verify and replicate current findings and more fully explore the relations among constructs within the tested models. For example, direct manipulations of perceived threat and effects on individuals' level of motivation for taking action would provide stronger tests of the relations between threat and motivation, and their effects on proenvironmental intentions, and subsequently, behavior. Past research pertaining to the effects of fear appeals on proenvironmental commitments (intentions/stated willingness to act) and behavior may be instructive (e.g., Hine & Gifford, 1991). Further, research that more fully explores the factors that influence individuals' perceptions of threat and motivation are also needed. Knowing, for example, the specific type and degree of experiences that lead to perceptions of threat, as well as the sources of an individual's motivation for action beyond that evoked by threat for a given environmental problem would be informative for increasing knowledge pertaining to why people choose to become proactively involved in various environmental issues. Studies that measure actual proenvironmental behavior, rather than self-reported behavior, and studies that consider additional environmental issues (e.g., water pollution, deforestation) are also needed so that boundaries of the proposed conceptual model can be better understood and delineated.

Findings from the current research may have implications for other areas of research directed at understanding how individuals cope with various environmental

problems, especially when the problems are perceived to be personally threatening. For example, results described earlier indicated that for the environmental problem of air pollution, perceived threat exerted a negative effect on individuals' intentions to engage in proenvironmental behaviors. When threat interacted with individuals' reported motivation to take action, however, intentions significantly increased. It is possible that other psychological variables, such as one's coping response style can affect or even mediate this relationship. Recent research has suggested that individuals can rely on coping appraisal processes that produce different outcomes in terms of behavioral responses. For example, Homburg and Stolberg (2006) and van Zomeren, Spears, and Leach (*in press*) have demonstrated that problem-focused and emotion-focused coping styles can help explain some reactions to environmental problems such as pollution and climate change. This research suggests that individuals appraise and cope with environmental problems in different ways, though it is currently unclear whether individuals actually view many environmental problems as sources of personal stress leading to motivated action (see Homburg & Stolberg, 2006). An important question for future research is to explore whether individuals do in fact view environmental problems as not only threatening, as demonstrated in the present research, but also whether such problems are in fact viewed as stressful issues in people's lives. Qualitatively, these two phenomena may reflect different psychological states that may have unique processes and effects. Empirical attention directed at disentangling these phenomena may help clarify existing findings, and shed light on the relationships between concern and behavior.

Finally, one fruitful direction for future research would be to investigate to what extent perceived threat and desired change fluctuate or change over time, especially in

response to various situational and environmental conditions and events. A possible benefit of the proposed conceptual model is that it affords a simple, though specific, explanatory means of modeling environmental concern not only in a cross-sectional fashion, but over time as well. Incorporation of the conceptual model within a longitudinal design that tracks evolving person-environment interactions in response to specific environmental issues and conditions may reveal important information pertaining to how individuals think about and behave in relation to many environmental problems. Such a design could also facilitate the investigation of various moderators and mediators affecting concern-behavior relations. This line of research may help inform a more dynamic understanding of how individuals think about and react to ever-changing environmental conditions, and what factors moderate and mediate such relations, while taking into account temporal aspects of change.

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